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THE DEVELOPMENT OF OREGON'S WATER POWER RESOURCES.

BY JOHN H. LEWIS.

ANALYSIS OF SALESMANSHIP AND THE DEVELOPMENT OF SALESMEN AS APPLIED TO THE ELECTRICAL SUPPLY BUSINESS.

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REINFORCED CONCRETE PIPE.

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THE VARLEY LOOP TEST—IV.

BY C. A. GAINES.

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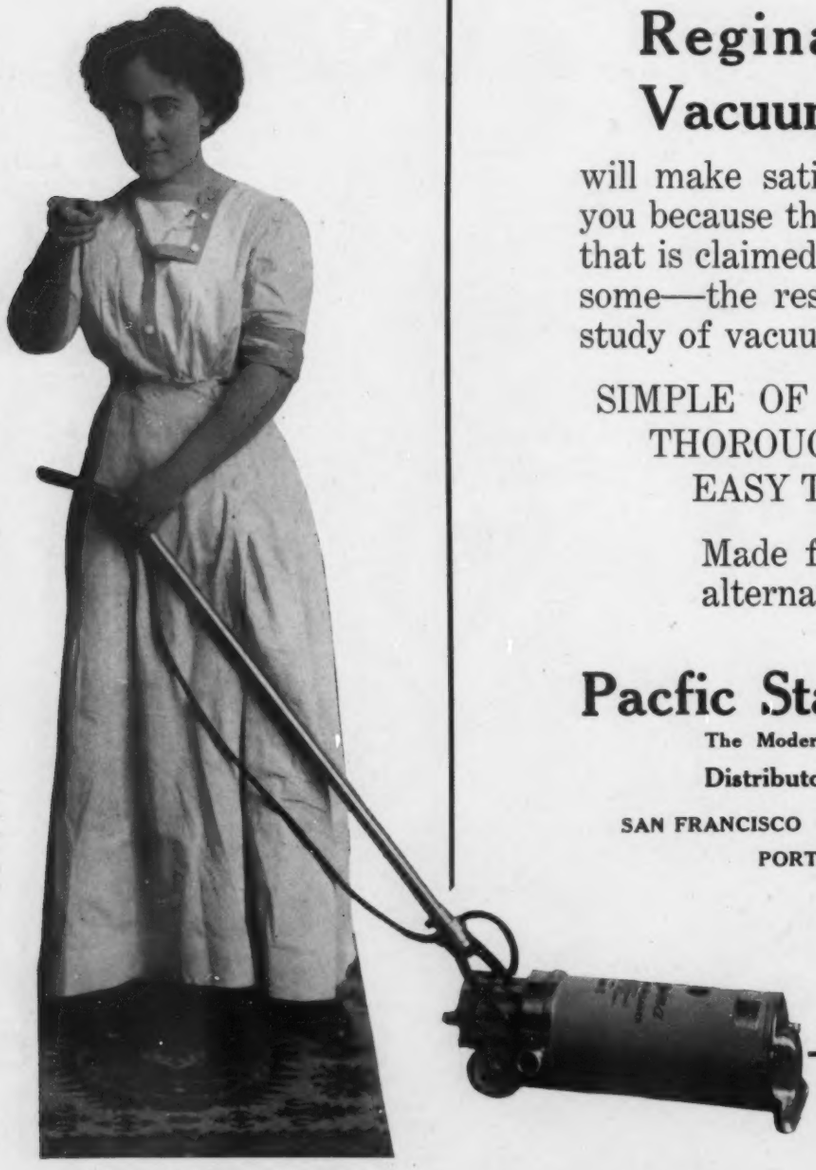

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OREGON'S WATER POWER RESOURCES[1]

BY JOHN H. LEWIS.[2]

Celilo Falls on the Columbia River.

That iron and steel can be produced in the vicinity of Portland at a cost comparing favorably with Pittsburgh is not altogether an extravagant statement. The rapid perfection of the electric furnace, coupled with the presence of abundant and cheap water power, convenient rail and water transportation, and the anticipated influx of foreign labor with the opening of the Panama Canal, will bring about this desirable result.

Through the use of the electric furnace the poisonous gases emanating from the ordinary smelting and blast furnace operations will be almost completely eliminated and we will enjoy the advantages of a smokeless manufacturing city in a climate unequalled for the production of roses. It is estimated by Herbert W. Wilson that the smoke nuisance in the country as a whole causes an annual loss of $500,000,000 or $17 per capita for each man, woman and child living in large cities. Aside from this financial consideration, the solution of the smoke problem will be a leading factor in the future development of a manufacturing city.

A careful summary of available information relative to water power indicates that more than three million horsepower can be developed within economical transmission distance of Portland. In this respect, it is believed that no other city of its size in the world, similarly located on tide water can make such a showing.

The problem confronting Oregon is therefore to awaken such a strong public opinion with respect to the immediate development of this resource, that the necessary legislation can be enacted. This development can be accomplished without injury to posterity,

[1]Paper presented before Oregon Society of Engineers' meeting jointly with The Commonwealth Conference at Eugene, Ore., May 17, 1913.

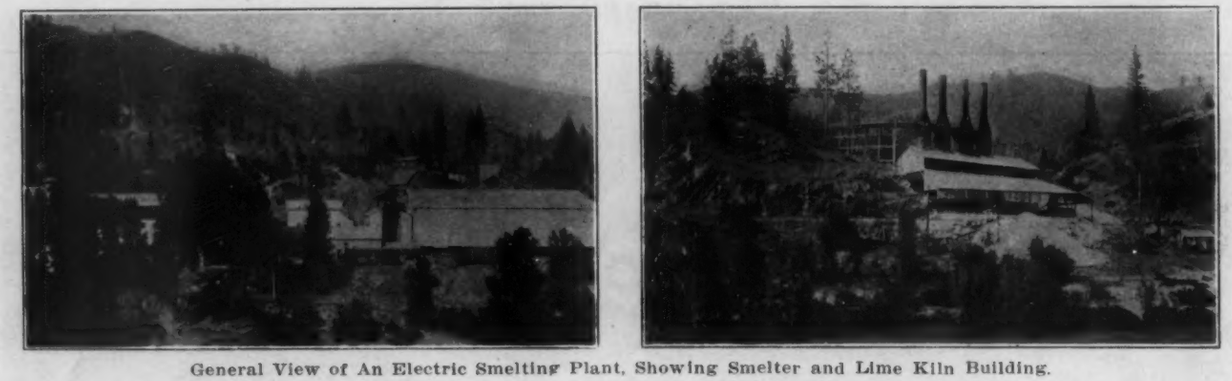
[2]State Engineer.

as all water power franchises in Oregon are limited by law to forty years.

Development of Electric Furnace.

The development of the electric furnace has been phenomenal. In 1905, there were few in operation. In 1910, sixty were in use or under construction for various purposes and in 1912, Vom Baur published a list of 131 electric furnaces which are used exclusively in the iron and steel business, with 14 listed as under construction.

This phenomenal development can perhaps be appreciated better from the statement that the carbon electrode of such furnaces has increased in some cases to 30 in. in diameter and 10 ft. in length, as compared with those for the ordinary arc lamp which are but little larger than a pencil.



General View of An Electric Smelting Plant, Showing Smelter and Lime Kiln Building.

When all of the projects now under way in Norway and Sweden are completed, 250,000 tons of pig iron will be produced annually in the electric furnace.

These few statements should be sufficient to convince us that cheap and abundant water power is likely to prove as great an economic asset for the development of a country as the presence of cheap coal.

Electric Steel.

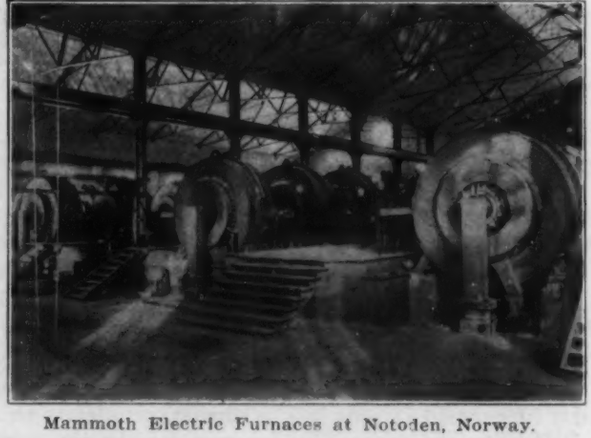
In the preface of a recent work translated from German, we find the statement that electric steel rails are found to be unbreakable in service when laid beside open hearth and Bessemer rails. With the latter scores of breaks have occurred in one season. The future of electric steel rails consequently seems assured. Electric steel castings have been on the market for the past four years and are looked upon with favor because of the high percentage of good castings and freedom from blowholes. The ability to make homogeneous tool steel, free from gases brought the electric furnace into commercial use about ten years ago.

Cost in Portland.

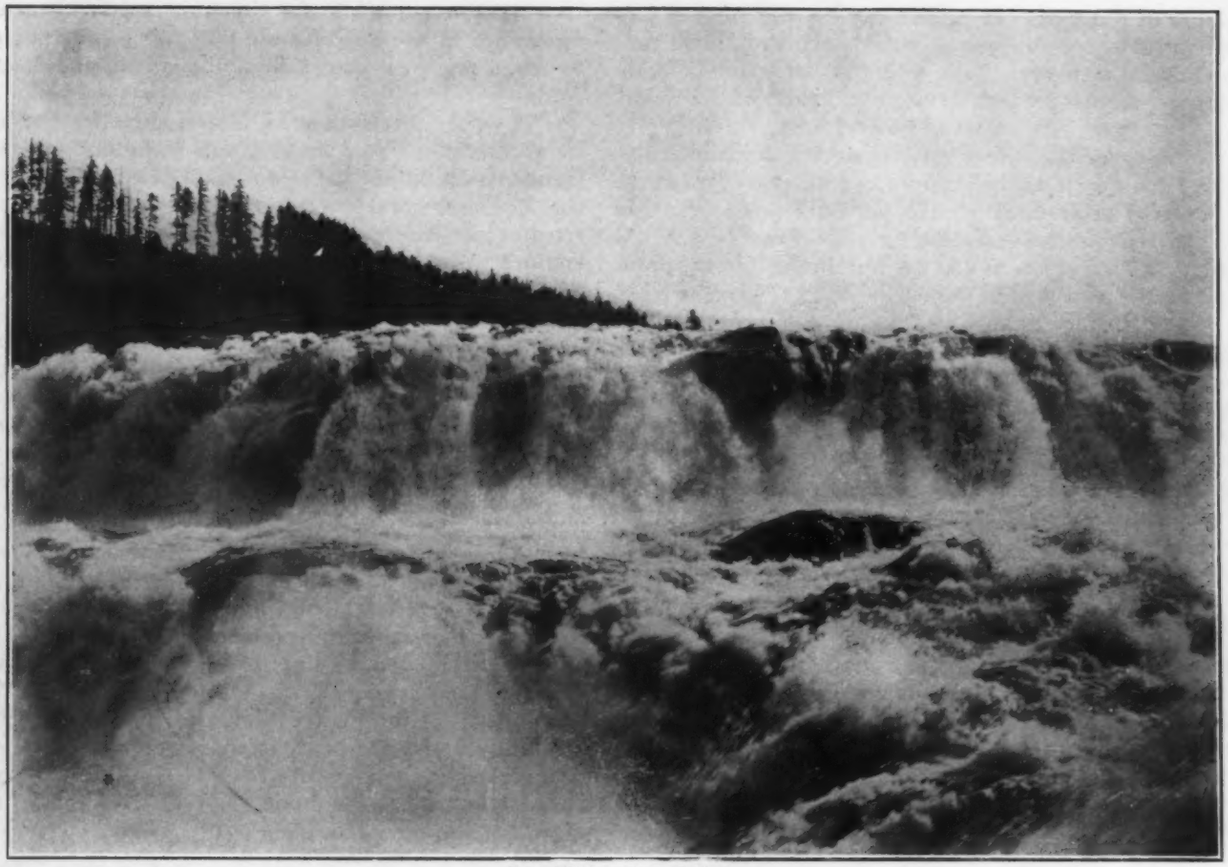
The cost of producing electric steel rails in the vicinity of Portland was estimated for the writer by Edward C. Potter, former superintendent of the Illinois Steel Company's plant in South Chicago. He states, under date of March 31, 1913, as follows:

"Considering the raw materials necessary, the supply of local iron ore does not exist in sufficient quantity or in economically available localities. Chinese iron ore, however, of a high grade has already been employed in the manufacture of steel on the Coast at a commercially economical price. It can be had in quantity and would be transported as a return cargo by ships transporting lumber and other commodities to the Orient, so that this could be relied upon as a source of supply. Moreover, there are vast quantities of high grade iron ore in Mexico contiguous to the Pacific Coast, which could be drawn upon for an indefinite period. The necessary carbon would be supplied by charcoal from the local forests, and limestone is everywhere available. These are all the raw materials required."

"At $9 per h.p. year for current and with the prices at which I know the various raw materials can be laid down at the proposed site of the plant, I have no hesitancy in stating that finished steel rails of standard weights could be there manufactured for $17.50 per ton. Standard open hearth rails are selling at $30 per ton at Chicago, which would mean approximately $40 per ton on the Coast, or let us say $35 per ton in the competitive territory from 500 to 1000 miles back from the Coast. Electric steel rails are commanding a premium of from $6 to $10 over open hearth rails, but assuming that the price of open hearth rails has to be met the proposed plant would be able to realize a handsome profit. The consumption of steel rails in the territory which would be tributary to the proposed plant would amount annually to fully 300,000 tons. This would require a plant capable of turning out 1000 tons of finished rails per day, which would be a plant of considerable size. There are also numerous other forms of steel which it might be desirable to manufacture and for which there would be a ready and a growing market. As to the technical and financial success of such a plant I have not the faintest doubt.



Mammoth Electric Furnaces at Notoden, Norway.



The Willamette Falls.

"As to the cost of Chinese ore, I know that it was delivered on the dock on Puget Sound for $4.50 per ton. This ore averaged 64 per cent metallic iron, making the cost just 7 cents per unit of iron which compares with about 8 cents for Lake Superior ore in Chicago."

At Heroult, Shasta county, Cal., 18 tons of pig iron are now being produced daily in the electric furnace at a cost of about $14 per ton, where the same grade at Pittsburgh costs $17.25 per ton. Freight to the Pacific Coast is given at $10.80, or a margin of $14 per ton in favor of electric iron on the Coast. Five additional furnaces are now being installed which will give a daily production of 120 tons of pig iron for this plant.

The approximate investment required for a steel plant in the East, capable of turning out annually 425,000 tons of Bessemer steel rails, including working capital, is between $23,000,000 and $33,000,000, according to the Commissioner of Corporations. As the capital cost of an electric steel plant is about one-third that of the old method such a plant for the Pacific Coast would require the investment of ten million dollars. It would consume about one million tons of iron ore and 330,000 tons of charcoal annually. As electric power is now being used in almost every department of the iron and steel industry, this plant would afford a market for approximately 150,000 continuous electrical horsepower.

Charcoal Industry.

The establishment of the iron industry in Oregon would greatly stimulate the lumber industry, as the waste from our saw mill and logging operations, which is now disposed of at a loss, could then be converted into charcoal at a profit. Mr. F. T. Snyder of Chicago believes that if electric energy was used in the distillation of this wood, enough by-products could be produced to make the net cost of the charcoal much lower than any other carbonaceous material for smelting purposes in Oregon. As it takes about two cords of fir wood to make one ton of charcoal, this incidental industry should prove of great benefit to the state, and afford an additional impetus for the development of water power.

Fertilizer from the Air.

The most important use to which our undeveloped water powers will eventually be put will doubtless be in the making of fertilizer from the air. The possibilities in this direction are almost inconceivable. Authorities estimate that all known deposits of natural nitrate fertilizers will be exhausted in about forty years.

A single company in Norway is now utilizing 200,000 horsepower in the manufacture of fertilizer from the air, giving employment to about 2,000 men. Over one-fourth of this company's product is said to be shipped to California and Hawaii in competition with the Chilean products. Bulletin No. 52 from the U. S. Department of Commerce and Labor states:

"It would require a capital investment of about $860,000,000 to assure the production of an amount of Norway saltpeter equal to that now consumed by the civilized world, assuming that sufficient cheap power were available."

As it takes about 1.6 horsepower year to produce

a ton of fertilizer, one million horsepower of that now going to waste in Oregon would furnish 625,000 tons of freight annually. This would go far towards maintaining regular freight service to all parts of the world.

Cost of Power.

In order that these various electric furnace industries may be established in Oregon, power must be delivered at from $9 to $15 per horsepower year, in comparison with $40 to $80, the cost of fuel power. At such low rates there can be but little, if any, profit in the electrical end of the business.

At Niagara Falls where the development cost was comparatively low, some power is now being sold as low as $9 per horsepower year. The limit of available power has however been reached and power prices are being advanced as old contracts expire. Most of the industries built up at that point are rapidly expanding and will have to seek new locations in the near future. These can be attracted to Oregon if we are in a position to furnish power at such cost as will permit them to live.

Public Development.

Senator Chamberlain recently introduced in congress a bill providing for the construction of a railroad in Alaska so as to make available for use the coal which is stored in this inaccessible region. Even when placed on the market at lowest possible cost, it is doubtful if this coal can compete with cheap water power in Oregon as Professor Richards of Lehigh University states that even in the Pittsburgh district it will be worth while for the iron and steel men to figure out in the near future, whether it will not pay to make pig steel direct from the ore in the electric furnace.

It would therefore seem more logical for the public to construct water power plants including necessary transmission lines, so as to make available for use the 3,300,000 horsepower now going to waste in the streams of Oregon. To produce this power in steam engines would require the burning of $144,000,000 worth of coal annually. In preventing this waste we are at the same time conserving the limited coal supply in Alaska for future generations. We might take a more active interest in the development of this power, if the streams were located in Alaska or some other inhospitable region, instead of at our very doors.

Water Power Policy.

Both the state and the nation have seen fit to impose heavy penalties on private capital seeking to put this power to use and have made no provision for its development with public funds. The state imposes an indeterminate tax, varying from 12½ cents to $2 per horsepower developed, the amount being adjusted from time to time by the state water board. Much of our undeveloped water power is located on property of the United States. This can be developed only under the provisions of a permit which can be revoked at will by the Secretary of the Interior. Both state and nation limit all franchises to the use of water for power purposes to a particular period.

Giant Schoenherr and Birkeland-Eyde Furnaces at Rjukan, Norway.

This restriction, however, is not as objectionable to private capital as the two indeterminate restrictions mentioned above.

In order to lessen somewhat this enormous waste of "white coal" it appears that we should do one of two things: either go backward and remove some of these restrictions so as to encourage development by private capital, or else go forward and make this resource available for use at public expense.

There is great confusion in both state and national laws relating to water, and capital is exceedingly slow to invest in large undertakings where the statute laws are not well supported by judicial interpretation. Furthermore, it will be some years before trade channels are fully established and the practical difficulties in the path of these new industries are fully overcome. Development by private capital will therefore be slow at best if each new industry to be established must also go into the electric power business, to insure a permanent supply of cheap power.

In Sweden, the rapid development of electrothermic industries is perhaps due largely to the fact that the government develops and furnishes power at low cost. For two years practically free power was granted the Iron & Steel Makers' Association, who constructed a $100,000 plant and carried on extensive experiments upon a commercial scale. The report of T. H. Norton to the U. S. Department of Commerce and Labor, October 16, 1911, shows these experiments to have been a success. Eugene Haanel states that advices from Sweden, dated April 29, 1910, show that 300,000 horsepower at Porjus will be developed soon, while another project of like capacity is in contemplation.

There is no doubt that such a policy pursued in Oregon at least during the experimental period, would bring about a much more rapid development than would be possible by private capital acting alone.

At the last session of the legislature a constitutional amendment, authorizing the issuance of state bonds for the construction of power plants, was submitted for a vote of the people in 1914. It is extremely important that the various organizations interested in the development of the state, study this question with a view to supporting or opposing such amendment. In this way an active and intelligent public opinion may be created which will result eventually in the enactment of some practical legislation to promote the early development of our water powers, having due regard to the rights of posterity.

USE OF ELECTRICITY IN NORWAY.

Probably more small towns and hamlets in Norway use electricity than in any other country, owing to the abundance of water power. In the country districts not only are there plants for each collection of five or six houses, but in many cases even small farms have their own generating plants.

In Christiana the electric plant, Kristiania Elektricitetsverk, is owned and managed by the city. The plant was built in 1891 by a German firm and cost $2,144,000, of which $1,340,000 has already been paid off from annual profits. The plant was originally fitted completely with German machinery, but one unit, lately added, was made in Norway.

All current consumed in Christiania is sent out from the city plant, but only about one-third of it is generated there. The city purchases 6500 kilowatts of alterating current from the Kykkelsrud Company, which generates electricity from the waterfalls at Kykkesrud, 40 miles from Christiania; 1950 kilowatts of alterating current are obtained from the city's plant at The Hammer waterfall, in the Maridalsvand or Maridals Lake district, 7 miles from here; and about 4000 kilowatts are generated at the city plant by steam. Of the 4000 kilowatts, 2400 are alternating and 1600 direct current, but it is all transformed to direct. The direct current is used in the center of the city and the alternating, which is 50 cycles per second, in the less congested parts and in the suburbs. The voltage used is 230 volts. Both currents are supplied night and day.

In 1911 meters were used by 4536 people, while 11,794 were charged a contract price for so many watts, an automatic cut-out, furnished by the company, "blinking" the current, or turning it off and on, until the amount used is reduced by turning off some lamps. The total current used in this same year, 1911, was about 10,000 kilowatts, of which 3859 was direct current and the balance alternating. Of the latter, 1346 kilowatts were furnished the street-car companies.

Notwithstanding the large profit made by the city, current is furnished consumers at very low prices. For lighting purposes the rates, per kilowatt hour, during the last 10 years, have been as follows: 1902 and 1903, 13.4 cents; 1904, 10.72 cents; 1905 to 1910, 8.04 cents; 1911, 6.97 cents. For technical purposes the rate has always been the present one, 5.36 cents per kilowatt hour. On contracts the prices are even lower. Thus, the lighting rate is $5.36 per 100 watts per year and rates for technical uses are $24.12 per horsepower up to 15, and $18.76 per horsepower if more than 15 horsepower is used.

In the other cities and in the country districts the rates are also very low. Alternating current, generated from water power, is usually used. The machinery in general is of German manufacture as are, also, the lamps and copper transmission lines, cut-outs, meters, etc. Some of the plants are owned by the communities and others are privately owned.

GATUN HYDROELECTRIC PLANT.

Excavation for the foundations of the hydroelectric station at Gatun spillway, which will generate electricity for all of the operating machinery and lights of the Panama Canal, is practically completed. The erection of the three penstocks was about 95 per cent completed on May 1. All of the turbo-generator sub-foundations are in place, three water turbines have been installed, and the erection of the turbo-generators is about 45 per cent completed. All of the structural steel for the station building has been received. All line construction material for the Cristobal-Balboa electric transmission line is now under contract, with deliveries promised in about four months. It is expected to award contract for the substation equipment shortly. Construction work on foundations has been started at New Culebra Siding.

ELECTRICAL PUMPING AND IRRIGATION

REINFORCED CONCRETE PIPE.

BY B. A. ETCHEVERRY.

Reinforced concrete pressure pipes depending entirely on the concrete to prevent percolation have been used successfully for heads as great as 100 ft. and are guaranteed by some pipe manufacturers for pressures as great as 150 ft. By using a metal shell either as a lining or imbedded in the concrete they are used for heads above 300 ft. For pressures as great as these the work must be carefully done. The pipe consists of a skeleton of iron or steel imbedded in a concrete shell. The metal is designed to take the entire tensile stress due to water pressure and water hammer. The concrete serves as a protection to the steel and is made only thick enough to give the pipe rigidity and prevent percolation.

Reinforcement of various kinds is used for pipe construction. Those most generally used are round steel rods, corrugated bars, twisted bars, expanded metal, metallic cloth, etc. Two French constructors use special bars in the form of small I beams and crosses claiming for them greater rigidity and strength.

The circumferential reinforcement is the most important as it takes up the entire stresses due to water pressure and water hammer. The safe working strength of the reinforcement is usually taken as 12,000 to 16,000 lbs. per sq. in. The longitudinal reinforcement is used either to hold the circumferential reinforcement or to resist temperature stresses due to contraction. When the pipe is built in sections, or if expansion joints are provided, little longitudinal reinforcement is necessary. When the pipe is built continuously the amount of reinforcement will depend on the extremes in temperature. To reduce the contraction when feasible it is advantageous to construct the pipe at a low temperature and to cover the pipe when constructed with an earth covering. An amount of reinforcement to resist temperature stresses of .2 to .3 per cent of the concrete area is generally sufficient.

The circumferential reinforcement for pipes of smaller diameter is wound by machinery in the form of a spiral and kept to the proper spacing by means of longitudinal rods tied to the spiral with wire. For large diameters of pipes and for heavy reinforcement, which cannot be wound in spiral, the steel is bent into hoops by means of rolls. The ends of the hoops are either lapped and tied together with wire, welded, riveted, or each end is bent into a hook and a longitudinal rod passed through the eye of the hooks. When the pressure is from the inside the longitudinal reinforcement is placed on the inside of the circumferential reinforcement, and for exterior pressure it is placed on the outside. Frequently for interior pressure the reinforcement is placed nearer the outside of the shell and for exterior pressure nearer the inside. M. Bonna, a French constructor, does not rely on the imperviousness of concrete for heads above 50 ft. and uses in addition to the ordinary reinforcement a thin steel shell, placed as a lining inside the pipe or imbedded in the concrete between two reinforcing skeletons.

Concrete proportioning must be accurately done to obtain an impermeable pipe. The mixture must be rich. The Reinforced Concrete Pipe Company of Los Angeles uses a 1 : 2 : 4 mixture for 25 ft. head and 1 : 2 : 3 mixture for heads from 50 to 100 ft. On the Umatilla project, Oregon, the mixture varied from 1 : 1.8 : 3 to 1 : 2 : 4. On the Belle Fourche siphons, South Dakota, it was 1 : 2¼ : 3¾ and on the Albelda siphon, Spain, it was 1 : 1.28 : 2.56.

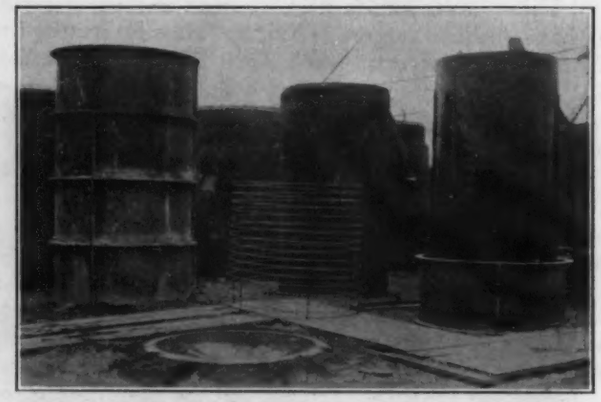
The reinforced concrete pipes may be of two different kinds, depending on the method of construction. They may be constructed:

1. By casting the pipes in short lengths, then laying them and joining the sections.

2. By constructing the pipe in place in the trench, The second method is generally used for larger conduits and requires a thicker shell, the minimum thickness being about 5 to 6 in.

Reinforced Concrete Cast Pipes.

The pipes are made by this method up to diameters of 6 ft. and in some cases greater. The sections may be as much as 10 or 12 ft. long. The thickness



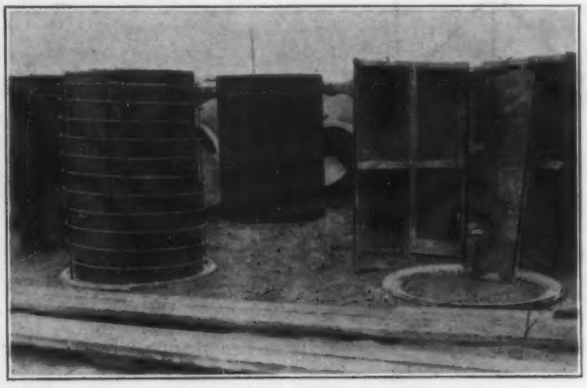
Metal Mould for Casting 47-in. Reinforced Concrete Pipe, Umatilla Project—Oregon.

of the shell seldom exceeds 2¾ to 3¼ in. and smaller pipes under 9 inches in diameter are made 1½ to 2 in. thick.

The method generally used is to mould the pipes vertically by placing the steel skeleton between the forms and filling the mould with concrete. The method used on the Umatilla project in casting one size of pipe is typical and is as follows:

The pipe is 47 in. inside diameter, 2½ in. thick, and 8 ft. long. The moulds consist of an interior collapsible form 8 ft. long made of steel plate ⅛ in. thick in two main parts bent on a 47 in. radius and hinged to a vertical joint 8 ft. long. The core is made collapsible by a third part consisting of a closing piece 8 in. wide and 8 ft. long, which with the other two pieces complete the inside circumference of the pipe. The outside form is made up in four sections, 2 ft. high, and each section is made of three parts, each part being 1/3 of a circumference and 2 ft. high. This form is made of ⅛ in. steel plate strengthened with

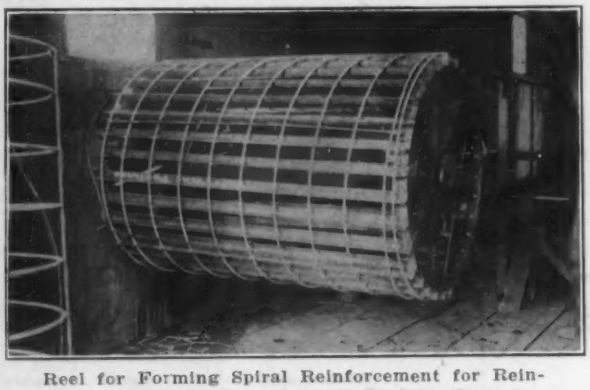
2x3x3/16 in. angles riveted to the edges of each of the 12 parts. The rivets are countersunk on the inside. The parts can all be bolted together. The base ring is of cast iron and gives the base of the pipe the proper shape. The reinforcement, which consists of round wire, is wound into spirals 4 ft. long, two spirals being used for the pipe 8 ft. long. The machine by means of which the spirals are made consists of a reel. On this reel are spacing bars with notches in which the reinforcement is placed when winding. Longitudinal rods 4 ft. long are placed on the outside of the reel and hooked to the reel at the two ends and the spiral and longitudinal rods are tied together with



Moulds for Casting 30-in. Reinforced Concrete Pipe, Umatilla Project—Oregon.

wire. After the spiral has been wound and tied to the longitudinal rods, the spacing bars which are hinged on the frame are folded over and the spiral removed. Then the spiral is made more rigid by cross lacing with wire.

The method of moulding is as follows. The moulds are well oiled and the base ring placed on the ground. The interior is placed in position and the reinforcing skeleton placed around the inside core. Then the lowest section of the outside form which is formed of the three parts bolted together is placed around the skeleton. The base ring gives the proper



Reel for Forming Spiral Reinforcement for Reinforced Concrete Pipe, Umatilla Project—Oregon.

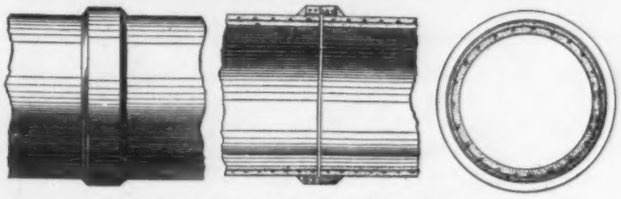
spacing to the inside and outside form. The concrete is machine mixed and consists of 1 part of Portland cement, 1.8 parts of sand, 3 parts of gravel with enough water to give a wet concrete. The concrete is placed in the moulds and well stirred and worked down with thin tamping rods. When the first section of the mould has been nearly filled, the other sections are bolted in succession, each being filled nearly to the top before the next one is put on. To fill the fourth section, a funnel shaped collar is placed around the inside core and bolted to the outside core. When filled, the collar is removed and the upper end of the pipe finished by hand. The forms are removed two hours after the pipe has been moulded and the base plate is left for eight days. For the 30 in. reinforced pipe the forms used are 4 ft. long and made of lumber lined with sheet steel. The interior core consists of two main parts and a third part or closing piece. These may be fastened together so as to be rigid. The outside form consists of four parts which are bolted

Joints.

The pipes after they have hardened sufficiently are placed in the trench where they are joined. If praticable, the best time to lay the pipe is in cold weather for a rise of temperature will reduce expansion and make the joints tighter while if they are laid in the summer time any contraction due to lowering of the temperature will tend to produce shrinkage cracks. The joints may be made in three ways: (1) bell and spigot joint; (2) collar joint; (3) lock joint.

The bell and spigot joint has been used on smaller pipes where the pressure is not great. On the Umatilla project some of the 30 in. pipe has been laid under a pressure head of 23 ft. with this type of joint. The pipes are similar to the non-reinforced pipe described further and have a taper end and a bell end, the joints being made in the same manner as the joints for non-reinforced pipe.

The collar joint is the method generally used in Europe and the method used for the larger pipes on the Umatilla project in Oregon. The joint is made by a reinforced collar from 4 to 8 in. long whose interior diam-



Collar Joint for Reinforced Concrete Pipe.

eter is slightly larger than the outside of the pipe. The collars are reinforced in the same manner as the pipe.

The ring is slipped over the pipe last laid in the trench and the next pipe is laid in position. Some prefer to leave a space of ¼ to ¾ in. between the ends of the pipe and to fill this space with cement mortar. Then the collar is placed over the joint. Both sides of the collar are stopped with mortar and through two holes in the collar a cement mortar in the form of grout is run in and fills the space between the interior of the collar and the outside of the pipe. For the 47 in. pipe on the Umatilla project the collar was made in three parts. Each part is shorter than 1/3 the outside circumference of the pipe but the circumferential reinforcement in the collar projects beyond the end of each part so that when the three parts are placed around the joint the reinforcements overlap and the collar is completed with cement mortar. The collar is 3 in. thick and 4 in. long, reinforced with two 5/16 in. rods.

LOCATING FAULTS IN UNDERGROUND CABLES

THE VARLEY LOOP TEST—IV.

BY C. A. GAINES.

Where one good conductor, for completing the cable loop, cannot be found in the cable under test, and another conductor of the same length and of the same size is not available, the Murray loop method of testing becomes more difficult. In fact, when a regular Wheatstone bridge test set is used the Murray loop method loses some of its simplicity and there is little advantage in its use, and the more accurate Varley loop test should be used.

As in the Murray test the Varley test also depends upon the formation of a loop with one good conductor and the faulty one, although it is not necessary that the two should be of the same size, nor of the same length.

By placing a known resistance in series with the faulty cable, R in Fig. 1, the Murray loop set up becomes the Varley loop and it is then possible to determine the actual resistance of the cable. It should be noted in the test described above that we do not deal with the actual values of the resistance of the cable under test, but with the ratio of these resistances. In the Varley loop test we obtain the resistance of the entire faulty conductor in ohms and the resistance in ohms of the conductor as far as the fault and then the ratio of these resistances is taken to give the ratio of the distances. This means that in using this method several tests must be performed in order to obtain the different resistances and that each of these tests requires a certain amount of calculation in addition to the final calculation when the results of the several tests are combined. But as the actual values of the resistances of the conductors under test

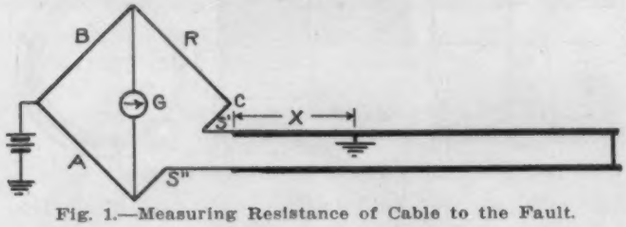


Fig. 1.—Measuring Resistance of Cable to the Fault.

are obtained, any irregularity in the connections or an abnormal value for the conductor resistance is readily detected. It sometimes happens that the burnout in a cable may introduce 10 or 15 ohms into the resistance of the faulty conductor, a fact which would not be detected by the usual method using the Murray loop.

As the most simple fault to locate with this method of testing is a ground on one conductor, with the two remaining conductors of a triplex cable in good condition, the application to such a fault will be first described and then mention will be made of some of the changes necessary to adapt it to some of the other conditions which may arise.

After first determining that such a condition exists, connect the two good conductors to the faulty conductor, taking care that the two connections do not touch one another, as in Fig. 1. If this precaution is taken, the resistance of the connections at this end of the cable will not appear in the final results.

If the battery connection to ground in Fig. 1 is removed and attached to "C," as in Fig. 2 we have the usual Wheatstone bridge set up for measuring a

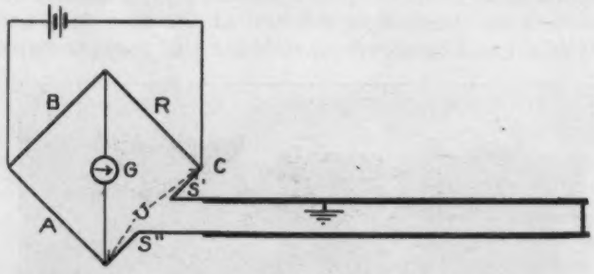


Fig. 2.—Measuring Resistance of Loop U.

resistance and in this case when the galvanometer is no longer deflected upon closing the battery and galvanometer keys $\frac{AR}{B} = U$, the resistance of the entire cable loop with the two leads S' and S".

If the battery is now removed from C and connected to the earth as in Fig. 1, a balance will be obtained when

$$B/A = \frac{R + S' + X}{U - (S' + X)}.$$ From this equation we get

$$X = \frac{BU - AR}{A + B} - S'$$

By changing the battery connections to the other good conductor (Fig. 3) we can obtain the resistance W of the entire faulty conductor by the same method

$$\text{and } W = \frac{BU - AR}{A + B} - S'$$

It should be noted that in this case by keeping the connections at the far end of the cable separate

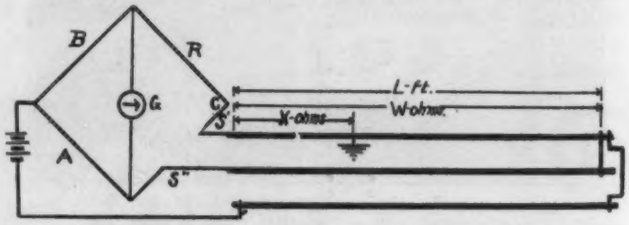


Fig. 3.—Measuring Resistance of Entire Faulty Conductor.

from one another the battery current is taken into the faulty conductor in such a way that all the resistance of the connection to the other good conductor becomes a part of the arm attached to arm "A" of the bridge. W, S' and R constitute the other arm of the bridge and are entirely independent of

the connections at the far end of the cable. The connection between the battery and the faulty conductor to some extent controls the amount of current delivered, but does not affect the balance obtained between the different resistances and so the battery connection does not require the same care that should be given the connections which enter into the loop.

It now becomes necessary to find the resistance of the lead S'. If the connection to the cable conductor is sufficiently secure so that one may be safe in neglecting the contact resistance, the value of the resistance of S' may be found by disconnecting from the cable and by determining this resistance by simple Wheatsone test.

If there is any question about the contact to the cable conductor care should be taken that the connection is not moved during the entire test and the Varley loop test can again be used, by attaching the

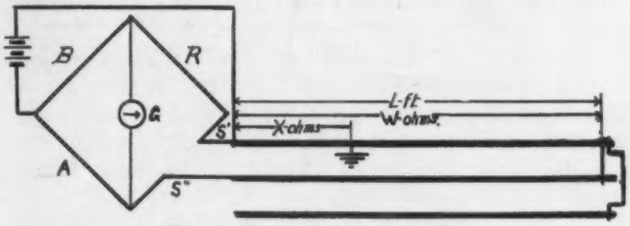


Fig. 4.—Switchboard Voltmeter.

battery connection to the faulty conductor near to but not touching S'. See Fig. 4.

When a balance is obtained $S = \frac{BU - AR}{A + B}$

Substituting this value of S' in the equations for X and W, they can be solved and then the ratio X/W gives the ratio between the distance to the fault and the length of the cable, or $\frac{XL}{W}$ in ft. = distance to the fault in feet.

If a short should develop in a cable instead of a ground, one of the defective conductors will be used as part of the loop and the other faulty conductor will take the place of the ground connection in the above test. The earth can be sometimes used for the battery conductor in determining "W," but never use the earth as part of the loop for two very important reasons. First—The resistance of the connections to ground cannot be depended upon to remain constant, and second—stray currents in the earth will destroy all accuracy of resistance measurements. For these reasons the earth is used in the loop tests only for the battery connection.

With two or three conductors of a triplex cable both shorted and grounded, a fourth conductor will be needed in using the above method of determining W. Almost as good results can be obtained without this fourth conductor by using the following method.

In Fig. 5 E and F are the two conductors which are shorted and grounded, and G is a good conductor which need not be of the same size nor of the same length as E or F. Connect E and G (Fig. 3) and measure the resistance of the loop EG. Call this R. Change the connection from E to F and measure the resistance of the loop FG, calling this R_2. Then connect E and F in multiple and the combination in series with G (Fig. 4) and measure the resistance R_3.

If $R_1 = R_2$, then E or $F = 2\ (R_3 - R_2)$. If R_1 differs from R_2, then the equation

$$e\ E = R_1 - R_3 + \sqrt{R_3\ (R_3 - R_1 - R_2) + R_1\ R_2}$$

can be used to solve for the resistance of the faulty conductor. This equation is obtained by solving for E from the three following equations.

$$E + F = R_1$$
$$E + G = R_2$$
$$\frac{1}{\frac{1}{E} + \frac{1}{F}} + G = R_3$$

The writer remembers one case where all three conductors of a 300,000 triplex were shorted and grounded and the fault was located by finding the resistance of one conductor to the fault and then calculating the length of the copper conductor which would have that amount of resistance. The particular difficulty which was encountered in this method of testing was to find the resistance of the conductor to the fault without including the resistance of the fault. Measuring the resistance of the conductors in pairs the following values were obtained:

E to F = .42 Ohms
F to G = 55.80 "
E to G = 55.80 "

It is evident from these values that E and F have a very low resistance short for the two resistance of F to G and E to G could be equal only under two conditions. Either the resistance of the short between

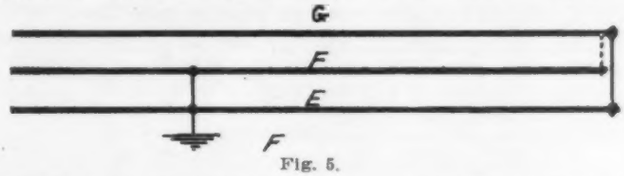


Fig. 5.

E and F is negligible as compared to 55.8 ohms, or else the connection between G and the other two legs happen to come midway in the connection between E and F. See Fig 5.

The probabilities of such a balanced connection occurring in a short are very remote, and it was therefore assumed that the first condition was true and that E and F were solidly connected at the short, and therefore the resistance of one conductor as far as the fault was $\frac{.42}{2}$ S' or .21 — S' Ohms. After correcting for the leads the resistance of the conductor alone was found to be .19 ohms, and the fault was then located by the equation

$$Z\ X = \frac{.19 \times 300{,}000\ \text{CMS}}{10.37} = 5500\ \text{ft.}$$

The use of 10.37 as the resistance of one mil. foot of copper assumes that the average temperature of the cable is approximately 68 degrees F., and in this case the results justified that assumption.

It is very seldom that one case of fault locating is similar to another case, and it is therefore impossible to make any detail set of rules for procedure in hunting trouble. Too much stress cannot be laid on the necessity for care in first determining what kind of a fault exists. Determine the character of the fault before attempting to locate it.

It is not always necessary to use all the refinements given above. The conditions under which the test is made will determine which ones can be omitted. For instance, if the resistance of the three loops AB, BC, and AC, in a three conductor cable are equal, it is safe to take one-half the loop resistance for the resistance of one of the conductors. But when connections are made under unfavorable conditions it is not safe to assume anything which can be determined by test.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY'S ANNUAL REPORT.

The board of directors of the Westinghouse Electric & Manufacturing Company has submitted to the stockholders the following report of the operations of the company and of its subsidiary companies, under date of May 20, 1913, for the fiscal year ending March 31, 1913. The income account for the year is as follows:

GROSS EARNINGS:		
Sales billed		$39,977,565.89
COST OF SALES:		
Factory cost, including all Expenditures for Patterns, Dies, New Small Tools and Other Betterments and Extensions: also Inventory Adustments and all Selling, Administration, General and Development Expenses		35,406,293.69
NET MANUFACTURING PROFIT		$ 4,571,272.20
OTHER INCOME:		
Interest and Discount	$ 294,887.22	
Dividends and Interest on Sundry Stocks and Bonds Owned.	647,908.46	
Miscellaneous—Royalties, etc.	53,768.20	996,563.88
GROSS INCOME FROM ALL SOURCES		
DEDUCTIONS FROM INCOME:		
Interest on Bonds & Debentures	$1,103,423.77	
Interest on Collateral Notes	409,672.34	
Interest on Long Term Notes and Mortgages	99,319.32	
Depreciations Charged Against Income	606,128.73	
Proportion of Expenses Incidental to Bond and Note Issues	90,000.01	
Miscellaneous	95,259.66	2,403,803.83
NET INCOME AVAILABLE FOR DIVIDENDS AND OTHER PURPOSES		$ 3,164,032.25
PROFIT AND LOSS CREDITS:		
Profit and Loss—Surplus, March 31, 1912	$6,648,964.29	
Profit on Bonds Purchased	1,747.40	
Adjustment of Appraised Values of Property and Plant Accounts	27,220.51	
Miscellaneous	90,238.97	6,768,171.17
GROSS SURPLUS		$ 9,932,203.42
PROFIT AND LOSS CHARGES:		
Dividends on Preferred Capital Stock	$ 279,909.00	
Dividends on Common Capital Stock	1,053,665.60	
Depreciation of Investments	966,919.56	
Miscellaneous	283,187.12	2,583,681.28
SURPLUS, MARCH 31, 1913, per balance sheet		$ 7,348,522.14

The value of unfilled orders as of March 31, 1912, was $8,137,961; as of March 31, 1913, the value of unfilled orders was $12,061,473. The average number of employes during the year was 20,542, as compared with an average of 16,000 for the previous year.

The surplus as of March 31, 1912, was $6,648,964.29. This balance was increased by the net income for the year and various items detailed in the statement of profit and loss, to a gross surplus of $9,932,203.42. Against this surplus have been charged dividends declared during the year, on the preferred stock at the rate of 7 per cent per annum ($279,909) and three dividends of 1 per cent each, aggregating $1,053,666, on the common stock, also miscellaneous charges totaling $283,187.12. These charges reduced the surplus to $8,315,441.70, against which depreciations of investments aggregating $966,919.56 were written off, leaving the surplus as of March 31, 1913, shown in the balance sheet, $7,348,522.14.

So far as your foreign companies are concerned, while further depreciation is possible in some of them, it will probably be more than offset by the appreciation of others; so that, after the final adjustment resulting from liquidation of the Russian company, it is believed that, under existing conditions, their aggregate book value will be a fair actual value.

Property and Plant, $20,467,224.74. The increase in this item of $1,272,036.68 over the figures as of March 31, 1912, after deducting liberal depreciation charges, represents necessary purchases of additional manufacturing equipment chiefly at the East Pittsburgh and Newark works and the erection of additional buildings at East Pittsburgh on real estate already owned. No purchases of real estate were made during the year.

A further extension was obtained of the lease of the property on which your company operates an iron foundry at Pittsburgh, Pa.

Securities of W. E. & M. Co. The increase in securities of your company held in the treasury is chiefly due to the receipt from the trustee of $686,000 face value convertible sinking fund gold bonds, in accordance with the provisions of the bond indenture, and to the purchase of $150,000 face value of debenture certificates due July 1, 1913. The bonds are held in the treasury for sale or use for sinking fund purposes, and the debenture certificates will be delivered to the trustee for cancellation on July 1, 1913, on which date the entire outstanding balance of the issue of debenture certificates will mature.

Foreign Companies. During the year the Canadian Westinghouse Company, Limited, made an issue of additional capital stock, to which your company subscribed for its pro rata amount, $243,400, at par, all of which has been paid for excepting $60,850, due under the terms of subscription on May 1, 1913.

Current Assets—$18,126,991.53.

The amount of reserve for notes and accounts receivable as of March 31, 1913, is believed to be sufficient to provide for any probable shrinkage in the book value thereof, with the possible exception of a note of the Security Investment Company, to which reference was made in your director's report for the year ended March 31, 1911.

Advances to Foreign Companies.

During the year the following advances were made to foreign companies on notes and open account:

Russian Company $454,155. As noted elsewhere, this company is now in process of liquidation, and your company should eventually recover all advances made since the receivership.

French and Italian Companies $275,032. This advance was made for the purpose of assisting the Italian company in financing a recent order for locomotives received from the Italian government, to which reference is made elsewhere.

Austrian Company $225,508. This advance was necessary to enable the Austrian company to produce and market drawn wire tungsten lamps, which type of incandescent lamp is rapidly replacing the old type of lamp throughout Europe.

French Lamp Company $50,000. While the stock interest of your company in the French Lamp Company is small, being less than $40,000, its affairs are so complicated with your other interests in Europe.that this advance was necessary, also on account of the introduction of the drawn wire type of lamp. Definite plans for dealing with this company have been formulated.

Working and Trading Assets—$18,510.222.56. A large increase in these assets over the value as of March 31, 1912, was to be expected in view of the increase in shipments billed during the year as compared with the previous year, and the increase of approximately $4,000,000 in the value of unfilled orders on hand as of March 31, 1913, as compared with the close of the previous year. The usual annual inventories of all raw materials, finished stocks and work in progress were taken and valued as purchase prices or manufacturing cost, or less. A fixed basis has been established for the depreciation of inactive stocks.

Other Assets—$7,011,528.36. The total of this item again shows a decrease as compared with the previous year. The amount of the expenditures for patents capitalized during the year was $26,381.70, all additional expenditures for patents and licenses and the cost of all development and experimental work having been charged to operating expenses.

Liabilities.

The changes in the funded debt of the company as of March 31, 1913, as compared with March 31, 1912, have been explained in the comments pertaining to sinking fund and investments. The outstanding balance of debenture certificates matures July 1, 1913, and is expected to be provided for by the sale of convertible sinking fund bonds of an equal total face value that under the terms of the bond indenture were reserved to retire them. The four-year notes issued under the plan for the discharge of the receivers of your company, matured January 1, 1913, and were paid.

During December, 1912, and March, 1913, your company borrowed with treasury securities as collateral, $3,500,000 on notes maturing in June and September, 1913. On August 1, 1913, the issue of $4,000,000 three-year collateral notes made August 1, 1910, will mature. Your directors have under consideration plans to provide for these maturities which it is expected will effect a considerable reduction of the total.

The acknowledgment of the board is hereby made to the officers and employes of the Westinghouse Electric & Manufacturing Company and its several subsidiary companies for their devotion to the company's interests and efficient services rendered during the year.

ANALYSIS OF SALESMANSHIP AND THE DEVELOPMENT OF SALESMEN AS APPLIED TO THE ELECTRICAL SUPPLY BUSINESS.[1]

In presenting a paper on these subjects, I appreciate the fact that it may not be proper to treat them under the same heading, but as they rightfully apply to the question of salesmanship, I would take the liberty of treating them as one subject, and hope in this way to point out not only a means of training men to the point that they are ready to enter the sales department, but offer a few suggestions for their guidance before taking up this branch of work.

The average employe in a supply organization does not appreciate what salesmanship really is and this is demonstrated by the number of men who are constantly striving to get into this branch of the business. Without considering for a moment their duties, responsibilities and obligations to the firm, they do not hesitate to make application to the sales department and very often those connected with supply institutions are inclined to place men in this branch, who, even though they may possess all of the other qualifications necessary for the make-up of the successful salesman, lack the technical and practical knowledge which is essential to their success.

I think we will all agree that the electrical supply business of today demands more of its employe than in any other merchandising line, and this is tenfold apparent when applied to salesmen.

The average man cannot learn his line thoroughly, even though he devotes half his lifetime to its study for the reason that there are not only a great many devices to handle, but the same devices under different conditions become entirely different articles, notwithstanding the fact that the popular selling articles of today are relegated to obsolete stock a few months hence.

Those of us who were fortunate enough to get into the business in its early stages, and have grown up with it, hardly realize what is expected of the average young man of today when he enters this field.

I believe that a great number of the failures of electrical supply salesmen may be attributed to the men who employ them, as the applicants know very little of the task they are about to undertake and do not realize what is expected of them. Therefore, my conclusions are that one of the most difficult problems is to select the proper man.

One cannot become a successful salesman simply because he knows his line from the practical side; for there are many other qualifications of equal importance. He must possess considerable knowledge of the technical end of the business, be a good correspondent, a good student of human nature, not only be a good talker, but have good control of his conversation, his temper and deportment, in order that he may perceive in an instant when he is on the wrong track. He must maintain his dignity under the most trying circumstances, possess tact and initiative, understand the application of suggestion to salesman-

[1] An address given by Mr. W. L. Goodwin, before the Pacific Division of the Electrical Supply Jobbers' Association at Del Monte, Cal., February 28, 1913.

ship, be aggressive and enthusiastic and last, and of prime importance, be loyal.

Now, without considering any of these qualifications in detail, we would immediately conclude that it is absurd to assume that any human being could possess all of these characteristics, and further, that they are not essential to the make-up of a successful salesman.

Now, let us analyze these points before drawing this conclusion and we will find a few reasons why we dismiss men from our employ after they have actually been assigned sales work, provided we have not given these points previous consideration.

First, technical knowledge of the business is necessary, as our men are constantly brought in contact with engineers, who, having been trained in the technical end of the business, will not, as a rule, tolerate a salesman who does not possess a knowledge of the law of electricity — E = IR; who does not know the difference between alternating and direct current, between a series and a multiple system, a grounded or metallic circuit and a thousand and one other essentials which may be listed under this heading.

Without argument we must agree that he must be able to compose a letter that will reflect credit to the organization. If he is not a judge of human nature, he cannot detect, when approaching a buyer whether the occasion is favorable or unfavorable for pressing his case, and naturally, does not know when to withdraw, leaving the way open for a future engagement.

Unless he is a good talker, he cannot impress his listener. It is the quality of talk that counts. It is not what a man knows, it is what he thinks he knows that he talks too much about. The right thing to say at the right time closes many a deal, while the reverse has lost many an order. It is said that the true salesman comprises nine parts judgment and one part talk, using the nine parts judgment to tell when to use the one part talk.

Temper, deportment and dignity need no explanation. The lack of either would be a vital failure in a salesman.

Tact includes intelligence, reserve, and all the other qualities that enable a man to adapt himself to circumstances. From the time of introduction, until you part, tact is winning or losing for you.

Discrediting your competitors shows lack of tact and is the basis of many lost orders, yet never mentioned in the salesman's lost order report.

If it were not for initiative, a salesman would be a parrot and we have no place in our business for parrots. The world reserves all of its big prizes for one thing, and that is initiative. Initiative is doing the right thing without being told. Next to doing the thing without being told is to do it when you are told once.

Admitting that there is a field for suggestion in sales work, why should a salesman be possessed of this quality? You must consider the mind of the customer and the successive conditions to be produced in it, as there is no doubt that the sale takes place in the mind.

In order to make your sales you have to induce people to buy. You, therefore, must command their attention and this can be accomplished partly by suggestion. The power of suggestion enables you to make the buyer listen after you have really engaged his attention, forget other things, be oblivious to all else but yourself, what you are saying, and what you have to sell.

Aggressiveness and enthusiasm, combined with all the other qualities, carry the salesman to his proper level. Without both of these qualities, he cannot progress. And last, loyalty; if there is any one quality that is essential to an employe, and particularly to salesmen, it is loyalty. The salesman is the representative of the house who meets the public and naturally he is the prey of the dissatisfied buyer, who soon learns to take advantage of the disloyal salesman. Under the most trying circumstances he must at all times defend the reputation of the house. I do not want a salesman who is not loyal, even though he possesses all of the other qualifications. The physical, as well as the moral effect, is bad. If I have lost confidence in him, I find myself withdrawing my support from him. If such a suspicion arises, I have it out with him, and if the traits of disloyalty continue, the quicker he leaves my employ, the better.

A salesman who is loyal, and possesses only a fair knowledge of business, with a touch of all the other qualities, is worth more in my mind than the one who could be measured 100 per cent in every other quality, but is lacking in loyalty.

Having covered the main points of character, what other qualifications should a salesman possess in order to hold his place in these days of strenuous competition?

He should be thoroughly familiar with the policy of the house—know his price book like he knows his ABC's; have a knowledge of the stock carried, the nature of the order he receives, the time it requires to assemble and ship it, in order that he will not make unreasonable promises which the house cannot fulfill.

He must be able to enlist the co-operation of the men on the inside. One of the duties of the salesman, and one which is seldom used by him, is the privilege of calling upon any or all the departments of the company when necessary to close the sale. The salesman usually does not realize the amount of power he controls in the hollow of his hand. He should not be afraid to call for help.

One weakness of the salesman of today is lack of confidence in his price book. As selling is an art, so is buying, and while the salesman is straining every point to land the order, the buyer is just as keen to purchase at a low price and never loses an opportunity of telling the salesman how much lower he can buy from his competitor.

I find that by compelling the salesmen to render reports of all business lost, and by properly classifying and filing the reports, going over them at reasonable intervals, and pointing out to the salesmen that they cannot obtain all the business and that a reasonable number of lost orders must be expected, enlists the confidence of the salesmen and encourages them to stand pat on prices. A salesman should not be brought to task for a lost order unless it can be clearly shown that the order was lost through his negligence. Try

to point out the real reason and in that way he is encouraged to further effort in the future.

The handling of salesmen is in itself a big subject, and I will not attempt to treat it in detail in this paper. I believe, however, that while the salesman is entitled to the full co-operation of the entire organization, he must not be given to understand that the sales department is the entire company. He should be compelled to observe and maintain the same hours and rules as the other employes and be restricted in his expenditures.

The granting of special privileges to salesmen as to conduct, or otherwise, is liable to create dissension among the other employes and lack of co-operation is the result.

Now, let us analyze who may be considered a salesman. The butcher and baker who travel around the country crying their wares are not salesmen, but peddlers, supplying necessities and securing their business through convenience of the buyer.

The man behind the counter knows the location of the wares, submits them for inspection and depends upon chance. He is a stock clerk.

The young and inexperienced man goes on the road with a prepared list of established goods and gets orders that would otherwise be mailed to the house. He is a fledging accident.

The old traveler depends upon acquaintances or personal friendship and favoritism. He is a "has been."

But when a man takes a new and untried article, studies its merits and selling qualities, becomes enthusiastic as to its possibilities, introduces it to his trade, finds users, creates interest, sustains the interest and creates a desire, turns desire into determination to buy his goods, secures confidence of his customers and gets the order; in fact, creates a market and supplies the demand, he calls himself a salesman, and he is. He is a producer and a diplomat. He sells by a scientific method and that is what salesmanship is today; a science.

With our increasing business, due to the rapid advancement of the art, men must be added to the selling force, not only to take care of the natural growth of the business, which will come, if we hold our place in the line, but also fill vacancies which occur in the course of business, and to provide for this demand, we must give some thought to the preparation of salesmen.

Having decided that we must resort to the training of our own men, not depending upon our competitors for our supply, therefore a salesman's training course should be provided, that the increasing demand will be taken care of.

Young men who, we believe, possess inherent ability to ultimately succeed in commercial sales work should be given a systematic training, schooled in the fundamental principles of salesmanship; encouraged in the study of electricity and made familiar with the policies of the company, the product you handle and thorough sales demonstrations and personal quizzes at regular intervals. Question them on subjects they should know. Propound questions that you are reasonably sure they cannot answer in order to see how they will handle themselves when they are in a similar predicament with customers.

The study of catalogues and price books, forms of contracts, sales reports, stocks carried, house forms, etc., are essential to the training of salesmen and unless a company is making such provisions, just so sure will they fall behind in the race for business.

In these days of modern and scientific business methods an efficient sales force cannot be created in a day, neither can it be purchased for a money consideration. It may be brought to a state of perfection only by a process of evolution, calling for careful judgment and wise discrimination in selecting the material to be used.

There must be on the part of both management and selling force, implicit confidence in each other, loyalty to each other's interest at all times and under all conditions.

A selling force thoroughly trained and woven together with due consideration to all the points mentioned when properly directed, can not help but get their share of the business at a satisfactory profit.

GAS ENGINE GASTRITIS.

BY H. N. SESSIONS.[1]

Los Angeles, California, April 15, 1912.

Rhyolite Hydro-Electric Company,
Garden Villa, Orange Co., Cal.
W. L. Dumpling, Manager.

Dear Sir:

Alas! I am compelled by terror to confess my error in trying to use gas engine for power. Six months' experience with this breech-loading fire-arm engine has been one nerve-racking nightmare. For a twenty-two horse it barked like a 44 Colt's; nay, its neighs were even louder. The company which reduced me to buy it is still in the "hands of a deceiver" and will not take it back, so for its disposal I am driven from the bunkman to the junkman. Oh! the misplaced confidence I put in that engine. After constant courting and the loss of one finger the ungrateful thing will not even turn over and reciprocate a stroke. Instead of a trusty one I find only a rusty ton. I have renewed every part of it except the name plate; but never again, not another part of it, til I part with it. I fed the engine on gasoline, naphthaline, benzine, lucine and kerosene. I greased it with glycerine, paraffine, cottolene and oleomargarine. It vacillated on vasoline and finally became a tippler on Tops, turning topsy-turvy and died on the diet. Now it rests serene a sight obscene in its oily refinery.

Come quick with your poles and wire. I have seen Smith's sturdy motor softly singing with your steady service while the air surrounding still smells sweet, so spare no speed, but serve the juice. I want appliances, too, with heat that's hot, also lamps that light, and a fan when it's warm to blow up a storm, and, damn it, last, but not least, I must have power with peace not grease.

Yours for relief,

AL. FALFA.

[1]Commercial Engineer Southern California Edison Company, Los Angeles, Cal.

JOURNAL OF ELECTRICITY
POWER AND GAS

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The California Water Commission

A bill establishing a Water Commission in California but awaits the signature of the Governor to become effective, or rather defective, in regulating future acquisition of water in that State. In its amended form, it represents a great improvement over the original bill proposed by the Conservation Commission, but it is still woefully ambiguous and lays the foundation for much litigation. While the motives of its framers are apparently of the best, we cannot but think that it is better to be delivered into the hands of evil-intentioned rascals than well-meaning fools. As an instrument to forge new fetters and retard the future development of water power resources it certainly is admirable.

The act creates a Commission of five; the Governor and the State Engineer by the virtue of their office, and three properly qualified members appointed by the Governor for a term of four years, at an annual salary of $5000 each. It shall be their duty to ascertain whether the water now in use has been appropriated under the present laws of the State, or if it has been put to the uses for which it was appropriated. If not, it is to be declared unappropriated, as is also any water that shall not have been applied to useful purpose within ten years hereafter. Such an investigation represents an unnecessary expenditure of State money for which the State has nothing to gain, as such action is one of the first duties of a new appropriator of lapsed claims.

The Commission is also given power to prescribe the time within which the full amount of water appropriated shall be applied to a useful purpose. If the full capacitiy is not developed within a period deemed reasonable by the Commission, any other applicant may be granted joint occupancy. The danger in this section resides in the possible abuse of the arbitrary powers of discretion given the Commission. A saving clause, however, requires such applicant to pay a due proportion of the cost of the original diversion works. Appeal from the decisions of the Commission may also be made to the courts.

The necessary procedure in applying for a permit to use unappropriated water is fully detailed. Such preliminary permit is revocable if construction is not started and completed within the time specified. When the work is completed to the satisfaction of the Commission, they may then issue a license which shall be effective as long as the water is used for the purpose for which it was appropriated. While this indeterminate license for power purposes is in accord with the recommendation of a committee from the Commonwealth Club of California, it does not offer sufficient protection to the investment to make the proposition attractive to the average investor. It is further subject to the condition that the property may be taken over after twenty years by any city or any political subdivision of the State. With reference to irri-

gation purposes, little or no excuse can be advanced for its inclusion in the bill.

Capitalization of a water right is definitely prohibited in the clause, "No value whatsoever in excess of the actual amount paid to the State therefor shall at any time be assigned to or claimed from any permit or license granted under the provisions of this act." While somewhat revolutionary in character, this provision is in accord with the most advanced ideas of public regulation of public utilities.

Before a permit or license can be issued, a fee must be paid, the amount depending upon the purpose to which the water is to be applied. If for the generation of electricity, the requirement is an initial payment of $2.50, "for each theoretical horsepower capable of being developed by the works up to 100 horsepower," the minimum fee being $25.00. For developments between 100 and 10,000 horsepower, the fee is $500.00, and when above 10,000 horsepower, $1000. When the license is issued, and annually thereafter, a charge of 25 cents per horsepower is to be made, except in private developments not exceeding 50 horsepower. For other than power purposes, the initial fee is $10.00, with an annual charge of 10 cents for each miner's inch. This annual charge is a bad feature of the bill, particularly in view of the fact that the State offers no return therefor. It is not countenanced by better legislation elsewhere, and is repugnant to public policy in the development of our water resources. Like all taxes, it must eventually be borne by the ultimate consumer.

Theoretically and individually, many of these requirements may be good; practically and collectively they will greatly hamper future development of water power by private initiative and capital. The financing of a water power project was difficult even before these new restrictions were exacted. With their enforcement, capital will be forced to seek new fields. Water is different from the other great natural resources, such as oil, coal or metal, in that its development enriches the country; mines in a sense may be said to impoverish a country, especially when developed by foreign capital. One is a benificent utilization, the other a selfish exploitation. Wisdom would therefore seem to dictate that every means be lent to encourage the use of water, and not to add to the discouragements contained in the provisions of this new law. Grave accusations are made of the manner in which this vicious piece of legislation was passed and there is strong probability that even if it be signed by the Governor it will be declared unconstitutional by the courts.

Responsibility for Strike Damage

Electricity has created a new world. So accustomed have we become to an electrical civilization, that it is only when the threat is made to stop its supply that one realizes the economic, social and moral influences which have emanated from it. The telegraph, telephone, electric light, motor and heating appliances have successively been perfected within the memory of many a man now living. The experiences of youth, united with the work of manhood and the reflections of old age, constitute the history and philosophy of electricity as we know it to-day.

Electricity spans distance, lifts weight and saves time, the three physical obstacles to progress which are so fundamental as to be adopted as the basis of all physical measurement. National and international unions, scientific, literary and industrial, have sprung up in quick response to the throbbing of the enlarged life it gives. Undeniably, it is the greatest agent of universal progress the world has ever known.

So intimately has electricity become interlocked in the chain of the every-day life of the every-day person that a concerted effort should be made to frustrate any such possibility to the interruption in service which has been threatened by the recent strike among the employees of the Pacific Gas and Electric Company. Happily, the company has been able to maintain a most praise-worthy service, and as this is written, a great majority of the strikers have returned to work and the artificial Light and Power Council is suffering from defection of members. The remaining problem is to prevent the recurrence of such trouble. There has been much praise in little fault found in our previous suggestion that matters of this kind be referred to arbitration by the Public Service Commission.

Law-makers have harnessed the public service corporations as the engineer has harnessed the forces of nature. But this law harness has not proved as efficient as the engineering harness. The collar has been unevenly padded, so that parts of the shoulder have become sore, while other parts have escaped the pressure of the draft. Important buckles have been omitted and all straps have not been sewed together. The horse has been compelled to conform to the harness, rather than the harness to the horse. It seems high time that some tribunal be established which will be mutually acceptable to the public utility company and to its employees. When the law regulates rates it should also protect investment.

During the past month there have been a number of strikes in different parts of the country. These have unnecessarily occasioned loss and suffering not only to the employees and the companies, but also to the public. The duties of the Public Service Commission include both regulation and protection. Under the latter heading, the United States District Court at Newark, N. J., has given a verdict against a municipality for losses caused by failure to provide protection against strike damage in the case of an express company, which comes under the head of public service. A damage to both property and to business resulted from inadequate police protection. If this verdict is sustained it will prove our contention that a public service corporation is entitled to the benefits and privileges of commission protection as well as subject to the burdens and responsibilities of commission regulation.

PERSONALS

ITEMS FOR THIS DEPARTMENT ARE SOLICITED FROM ALL READERS

R. Q. B. Cleavenger of the Phoenix Glass Company, Pittsburgh, was in Seattle recently.

E. L. Callahan of the Faries Manufacturing Company Decatur, Illinois, was in Seattle some days ago.

Stuart Hines has become associated with the sales force of the Pacific States Electric Company of San Francisco.

H. A. Sayles of Holobird-Reynolds of San Francisco, has been spending a few days in Sacramento in the interests of business.

Morton Allen, general telephone and sales manager of the Northern Electric & Manufacturing Company of Montreal, was in Seattle recently.

E. Cutting has been appointed superintendent of the municipal electric lighting plant at Riverside, Cal., succeeding F. A. Worthley, resigned.

H. Bewlay, chief engineer of the Ideal Electric & Manufacturing Company of Mansfield, Ohio, is visiting their Pacific Coast office in San Francisco.

H. C. Reed, superintendent of the Pacific Fire Extinguisher Company, has returned, after a month's stay in Portland attending to business interests there.

H. Harris, formerly associated with the General Electric Company at Schenectady, and later located in London, has become identified with the sales force of the Pacific States Electric Company.

Raymond J. Andrus, vice-president and general manager of the Northwest Electric & Water Works of Seattle, is in San Francisco in connection with the proposed gas works at Bremerton, Washington, which he is promoting.

J. C. Rendler and **W. S. Hanbridge** have been re-elected as directors to the National Electrical Contractors' Association to represent the California State Association of Electrical Conractors at Chattanooga, July 17, 18 and 19, 1913.

Geo. A. Boring, connected with the Pacific States Portland branch since its opening, has been appointed to the position of district sales manager of that house, and **E. A. Norton** appointed to a similar position, covering Seattle territory.

E. J. Barry, electrical engineer of the St. Paul & Tacoma Lumber Company, Tacoma, has returned from his trip to Elk River, Idaho, where he made tests on the electric logging donkeys now in operation on the Potlatch Lumber Company's holdings.

R. B. Elder expects to leave San Francisco during the coming week on an extended Eastern trip, visiting his several principals, among them the Ideal Electric & Manufacturing Company at Mansfield, Ohio, and the Moloney Electric Company at St. Louis.

W. W. S. Butler has resigned as general manager of the Western States Gas & Electric Company at Stockton, Cal., after most efficient service in firmly establishing the Byllesby interests in the town. **Sam Kahn** has succeeded to his duties. Mr. Butler is now in the East.

W. E. Herring, who recently became connected with Puget Sound Traction, Light and Power Company as industrial agent, has established headquarters in the Pioneer Building. He will devote his time to procuring new industrial enterprises for the Sound country.

Harry Tittle has taken over the electrical department of the John G. Sutton Company, and same will be conducted under the former's name. Mr. Tittle has been connected with the electrical contracting business for many years, and has had charge of some of the largest electrical installations in this vicinity.

M. E. Crawford of the Seattle Section, A. I. E. E., was elected as a delegate to attend the annual convention to be held at Cooperstown, New York, June 23d to 27th. He will leave about June 1st and visit a number of the Stone & Webster plants in the east before he goes to the convention.

Allen E. Ransom for some years connected with the Seattle office of the Westinghouse Electric & Manufacturing Company in the industrial and power department and later assistant general manager of the Olympic Power Company at Port Angeles, Washington, is now manager for the Caldwell Machinery Company, Seattle.

Kunihiko Iwadare, managing director of the Nippon Electric Company, Ltd., of Tokyo, which firm is representing the Western Electric Company in Japan, and **I. Miyaji**, of the same concern, were recent visitors in San Francisco, en route to Chicago and New York, where they expect to spend considerable time visiting the Eastern electrical concerns.

W. A. Blair, president of the Electrical Credit Men's Association, has called the regular annual meeting and banquet of the association for June 3rd. Among the invited guests will be **W. W. Briggs** of the Great Western Power Company; **H. V. Carter**, Pacific States Electric Company; **F. Skeel**, Crouse-Hinds Company, and **F. H. Leggett** of the Western Electric Company.

At the annual meeting of the American Institute of Electrical Engineers held May 20th, **C. O. Mailloux** of New York was declared elected president. **H. H. Barnes**, New York, **J. A. Lighthipe**, Los Angeles, Cal., and **Charles E. Scribner**, New York, were declared elected vice-presidents; **B. A. Behrend**, Boston, Mass., **Peter Junkerfield**, Chicago, Ill., **H. A. Lardner**, San Francisco, Cal., and **Lewis T. Robinson**, managers; and **George A. Hamilton**, treasurer.

Franklin F. Griffith, the incoming executive of the Portland Railway, Light & Power Company, made his initial appearance before 2000 employes of the company at the Oaks Theater last week, and at the same time **B. S. Josselyn**, the retiring president, made his farewell address in which he urged that the same loyal co-operation and fellowship be shown to Mr. Griffith that had been extended by the carmen to himself during his six years at the head of the company.

Golden Poppy Special Party left Thursday morning, making up one of the jolliest, liveliest bunch of Western boosters which has invaded the East for some time. The party was made up as follows: Mrs. Walter H. Seaver and three children, San Francisco; Fred H. Poss, Benjamin Electric & Manufacturing Company, San Francisco; Miles F. Steel, Benjamin Electric & Manufacturing Company, San Francisco; Carl E. Heise, Westinghouse Electric & Manufacturing Company, San Francisco; Mrs. Carl E. Heise, San Francisco; J. W. Wiley, West Sacramento Electric Company, Sacramento; Mrs. J. W. Wiley, Sacramento; Chas. F. Conn, J. G. White & Co., San Francisco; Arthur H. Halloran, Journal of Electricity, Power and Gas, San Francisco; A. J. Myers, Wagner Electric Company; Harry Hays, Mt. Whitney Power Company, Visalia; Mrs. Harry Hays, Visalia; T. E. Bibbins, General Electric Company, San Francisco; Mrs. T. E. Bibbins, San Francisco; H. B. Squires, H. B. Squires & Co., San Francisco; C. E. Mynard, Great Western Power Company, San Francisco; E. A. Quinn, Allis-Chalmers Company, San Francisco; Thos. E. Collins, Westinghouse Electric & Manufacturing Company, San Francisco; A. Garnett Young, Telephone Electric Equipment Company, San Francisco; Mrs. A. Garnett Young, San Francisco; H. T. Matthew, Electrical World, San Francisco; M. V. Van Fleet, San Francisco; George A. Campbell, Truckee River General Electric Company, Reno, Nev.; Mrs. Geo. A. Campbell, Reno, Nev.; Mrs. C. H. Harwood, New York, N. Y.; John Coffee Hays, Mt. Whitney Power Company, Visalia; Mrs. John Coffee Hays, Visalia; Fred G. Hamilton, Mt. Whitney Power Company, Visalia; Mrs. Fred

G. Hamilton, Visalia; O. D. Pierce; S. M. Kennedy, Southern California Edison Company, Los Angeles; A. E. Murphy, Southern California Edison Company, Los Angeles; W. S. Sessions, Southern California Edison Company, Los Angeles; H. M. Hall, General Electric Company, Los Angeles; J. R. Glynn, Salt Lake, Utah; K. E. Van Kuran, Westinghouse Electric & Manufacturing Company, Los Angeles; Mrs. K. E. Van Kuran, Los Angeles; A. E. Drake, Woodill, Hulse & Co., Los Angeles; Mrs. A. E. Drake, Los Angeles; Wm. Baurhyte, Los Angeles Gas & Electric Company, Los Angeles; Miss Constance Metcalf, San Francisco.

MEETING NOTICES.

Oregon Technical Club.

The regular luncheon of the Oregon Technical Club was held at the Portland Commercial Club, Monday, May 19th, the speaker of the day being Mr. D. L. Williams, architect. Andrew Fouilhan presided over the meeting. The regular chairman and speaker, as announced previously, were unable to be present on account of business outside of the city.

Electrical League of Southern California.

The Electrical League of Southern California held its regular meeting at the Angelus Hotel, Tuesday, May 27, 1913. Mr. O. H. Ensign, Chief Electrical Engineer of the United States Reclamation Service, gave a talk on "Power Development of the Reclamation Service," which was thoroughly enjoyed by all present.

Los Angeles Section, A. I. E. E.

The Los Angeles Section of the American Institute of Electrical Engineers held its regular monthly meeting at Hotel Hollenbeck, on Tuesday evening, May 27th. Prof. R. W. Sorensen of Throop Polytechnic Institute, Pasadena, presented a paper on "Some Values of Wave Form Analysis." The paper was followed by an interesting discussion of the facts presented.

Electrical Development and Jovian League.

Tuesday's meeting was Jobbers' Day, and the meeting was conducted by H. V. Carter of the Pacific States Electric Company. The speakers of the day were F. Skul of Crouse-Hinds Company, who is on the Pacific Coast at present, and F. H. Leggett of the Western Electric Company, who told some very interesting happenings of the days when he toured Europe and the Orient.

Portland Electrical Contractors' Association.

The regular monthly meeting of the Portland Electrical Contractors' Association took place at the Portland Commercial Club at 6:30 p. m., May 14th. The following officers were elected: President, W. O. Fouch; vice-president, Robert Skeen; secretary, F. C. Green; treasurer, J. R. Tomlinson; Knight; membership committee, Messrs. Drouillat, Littler, Knight; membership committee, Messrs. Drouillat, Littler, Walker and Potter. The committee to have charge of the next semi-annual state meeting, which is to be held Monday evening, June 9th, the week of the Rose Festival, is as follows: Messrs. Tomlinson, Pierce, Smith and Littler.

Seattle Jovian League.

The Seattle Jovians were addressed at their luncheon given on May 23d by Roland W. Cotterill, secretary to the city park board. The address covered the parks, boulevards and playgrounds of the city. The talk was illustrated showing the successive steps that have been employed in bringing them to their high state of perfection. Particular stress was laid on the playground phase of the subject, the speaker claiming that statistics would show Seattle further advanced in this respect than any other city in the country except Chicago. The resignation of C. M. Bliven, chairman of the league, was received and laid on the table for action at a future meeting. The committee selected to report on a plan for participation by the Jovians in the coming Potlatch made its report and same will be the order of business for the next regular session. The plan outlined by the chairman of the committee gives promise of being satisfactory.

Portland Section, A. I. E. E.

The last monthly meeting of the Portland Section of the American Institute of Electrical Engineers was held in the old grill of the Oregon Hotel at 7 p. m., May 20th, where 50 members and their friends sat down to an elaborate banquet.

During the luncheon they were entertained by Messrs. E. I. Whitney and E. A. West, with many short poems, squibs, and stories, applicable to the business of electrical engineering and to the various members present.

Mr. I. E. Staples, accompanied by Mrs. Staples, rendered several vocal solos. Several piano solos, rendered with credit by Mr. J. Paddock. Dophne Lewis and Marion Rollins, with their vocal solos, completely dispelled the cares of the most sedate, and Mr. S. I. Weill illustrated what an engineer could accomplish in the mastery of music, through the medium of a mandolin.

Talks were given by the following gentlemen: Messrs. H. R. Wakeman, G. P. Nock, O. B. Coldwell, W. A. Hillebrand, H. M. Friendly and W. D. Scott. After the banquet the officers for the ensuing institute year were elected as follows: G. P. Nock, chairman; R. F. Manges, secretary; C. E. Condit, W. D. Scott, H. R. Wakeman, executive committee; H. M. Friendly, delegate to the national convention at Cooperstown, N. Y.

Everyone present was unanimous in the opinion that this banquet was one of the most enjoyable affairs ever held by the local section of the Institute.

Oregon Society of Engineers.

On May 17th, the Oregon Society of Engineers conducted an excursion party to the State University at Eugene. Three hundred representative men and women from all parts of the state gathered together for this trip and participated in the Fifth Annual Commonwealth Conference. At this time a movement is on foot to referend the legislative appropriations for the maintenance of the university and the excursion was calculated to serve as a remonstrance against such movement.

The party traveled via the Oregon Electric, leaving Portland by special train at 7:30 a. m., and at 11 a. m. reached Eugene, where autos were in waiting. The famous "Radiators" of Eugene, five thousand strong and known in and out the state for their "Eugene way" of doing things, conducted the entire party about the city for a short drive, then out to the university. President P. L. Campbell of the university, and Mayor D. E. Yoran of Eugene delivered addresses of welcome and responses were given by President W. H. Graves of the Oregon Society of Engineers and President James Kerr of the Oregon Agricultural College. A splendid luncheon was served in the gymnasium by the girls of the College of Domestic Science. The class in dramatic art then gave Peer Gynt and scenes from Midsummer Night's Dream, interspersed with folk dances.

At the session for engineers a paper was presented by Mr. Fred F. Henshaw, District Engineer, U. S. Geological Survey, entitled, "State and National Co-operation in the Development of Oregon's Water Resources." State Engineer John H. Lewis and Mr. W. K. Newell of the State Horticultural Society, led the discussion of the paper.

Mrs. Campbell, Mrs. Friendly and Mrs. Dixon, wives of the president and regents of the university, held a reception for the women of the party and entertained them at luncheon in the Japanese tea room of the Hotel Osburn. The men were entertained by the Eugene Commercial Club under the splendid supervision of Mr. Morris J. Duryea, Manager Publicity Department. At 8 p. m. the Engineers' special swung out onto the main line bound for home, bearing 300 persons who had never known a happier day.

INDUSTRIAL

THE E. S. B. AXLE LIGHTING SYSTEM.

The axle lighting system which has been in process of development by The Electric Storage Battery Company for a number of years has recently undergone a most successful test on the system of the Atchison, Topeka & Santa Fe Railway, as a result of which the Santa Fe has placed an order for sixty-two of these equipments. This system combines simplicity, reliability, minimum attention and maximum battery life. It is a constant voltage rather than a constant current system. The accompanying diagram, Fig. 1, illustrates the mode of operation.

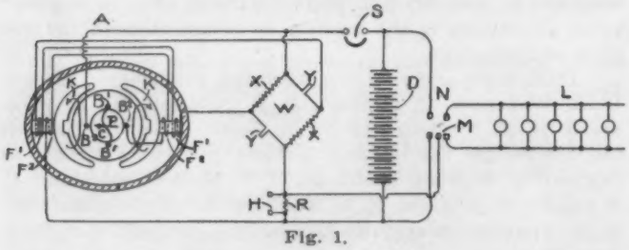

Fig. 1.

The dynamo A is of the Rosenberg type used abroad very extensively for a number of years in axle lighting, but redesigned by The Electric Storage Battery Company to operate in connection with its constant voltage regulator. Current in the primary field winding F^1 produces a small primary field flux represented by the arrow P, which induces a small electromotive force between the short-circuited brushes B^1 and a flow of current through the short-circuit connection C. This current, flowing through the armature winding, produces by armature reaction the secondary or principal field flux, which does not pass through the frame of the machine, but is confined to the heavy pole shoes and the armature as shown by the arrows K. This latter flux produces the electromotive force at the principal brushes B^2, which are connected to the external circuit, a series field winding F^2 in this circuit serving to balance the armature reaction due to load. An important advantage of this type of machine lies in the fact that it generates the same polarity with either direction of rotation, thus requiring no pole changer.

The primary field winding F^1 is connected across opposite junction points of the Wheatstone bridge W, the other two junction points being connected respectively to the positive and negative terminals of the machine. This bridge is designed to give the constant voltage characteristics above mentioned. It includes fixed resistances X in opposite branches and iron wire ballasts Y in the other two branches.

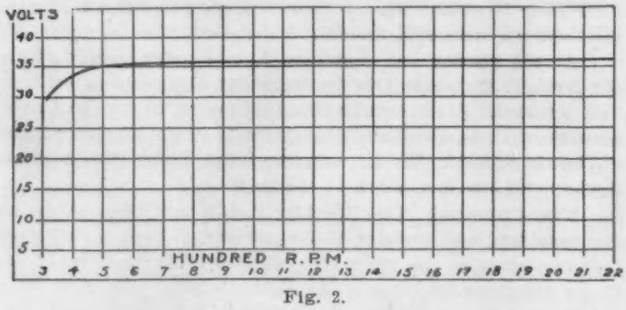

Fig. 2.

The latter, on account of their high temperature coefficient, have a practically constant current characteristic under operating conditions. This combination of circuits produces a field excitation continually diminishing with increase of speed. The resulting speed voltage characteristic of the dynamo is shown in Fig. 2.

An automatic switch S connects the dynamo to the battery D when the voltage of the former is slightly above that of the latter and opens when the output of the dynamo drops to zero. The knife switch N connects the lamp circuit L to the battery.

The voltage of the dynamo is fixed at a point slightly above the floating voltage of the cells, thus insuring that the battery is always fully charged. The difference between this voltage and that of the battery on discharge is, however, so small and the change from one to the other so gradual that no lamp regulator is required.

Should it ever be found necessary to give the battery a high voltage charge, this may be done during a daylight run by means of the fixed resistance R, normally short-circuited by the switch H and also by the clip M on the main lamp switch. When both of these switches are open, the voltage of the dynamo is raised by an amount determined by the value of the resistance R. Whenever lights are required, the closing of the lamp switch N short-circuits the resistance R, reducing the voltage to normal and eliminating the possibility of excessive voltage at the lamps. During five months of continuous operation of a demonstration equipment, no occasion for such a high voltage charge has arisen.

This system automatically adjusts the output of the dynamo to the requirements of the service, and gives the battery the slight amount of overcharge required to keep it practically full and in good condition, but no more, producing conditions of operation ideal for maximum battery life. Should the battery become discharged by a prolonged stop with lamp load on, its charge will be rapidly restored during the subsequent run. Should the car be transferred from a daylight run to one requiring considerable artificial lighting, the output of the dynamo will increase to meet the changed conditions of service. This is all accomplished automatically without manual adjustment of any kind.

NEW CATALOGUES.

The Improved Equipment Company, combustion engineers at 60 Wall steet, New York City, have published an instructive catalogue on Silica Retorts and Settings for Gas Benches.

Bulletin No. 152 from the Crocker-Wheeler Company is an interesting exposition of steam turbine driven generators for alternating current ranging in capacity from 50 to 6000 kw. and for direct current for from 1 to 300 kw. at speeds of from 4000 to 1400 r.p.m.

The Chicago Pneumatic Tool Company of Chicago, Ill., has just issued a bulletin covering their complete compressor line, and treating of general information of value to users of compressed air. The bulletin contains information for intending purchasers showing the data required for intelligent estimates.

The General Electric Company has recently issued the following bulletins: No. A4071 illustrates and describes Ornamental Lamp Brackets and Center Span Suspension Fixtures for Series and Multiple Incandescent Street Lighting. No. A4095 is devoted to d.c. Switchboards with Equalizer Switches on the panels, double polarity, 125 and 250 volts. No. A4087 gives information on d.c. Motor Starting Panels for heavy service. Electric Arc Headlights is the subject of No. A4061, which contains much material of interest and value. No. 4974A gives a graphic comparison of the advantages of Edison Mazda Lamps for Standard Electric Railway Service.

REMOVAL NOTICES.

The Kendrick Electric Company has closed its store at 774 Commerce street, Tacoma, and moved the stock to Seattle.

Ford, Bacon & Davis, the Sierra & San Francisco Power Company, the Coast Valleys Gas & Electric Company, and the Monterey & Pacific Grove Railway Company, announce the removal of their general offices to 58 Sutter street, San Francisco, Cal.

NEWS OF THE ELECTRICAL CONTRACTORS.

The electrical contract for wiring the new Northwestern Bank Building, on Morrison street, between Sixth and Seventh streets, Portland, Oregon, has been awarded to the Pacific Fire Extinguisher Company. This company has also obtained the electrical contract for the Trimble Estate building on the northeast corner of Park and Oak streets.

The electrical contract for the new theater, located at Fourth and Burnside streets, Portland, Oregon, has been awarded to the Caffery, Reardon Company of Portland.

Ne Page, McKenny & Company, of Seattle, Wash., have been awarded the electrical contract for the Davenport Hotel at Spokane, Wash.

C. H. E. Williams, Henry building, Seattle, has the contract for electrical installations in the new Colonial theater building being erected on Fourteenth and Pike streets.

NEWS OF WASHINGTON PUBLIC SERVICE COMMISSION.

The Washington public service commission has ordered a reduction of gas rates in the city of Spokane. The commission found that a fair valuation of the plant of the Spokane Gas & Light Company and the Spokane Gas & Fuel Company, operated as one company or corporation is $1,100,000. The present schedule of rates is as follows: Net rates, $1.50 per 1000 cu. ft. (flat rate); gross rates, $1.75; discount 25 cents; minimum charge, 25 cents per month. The new schedule is as follows: Net rates: First 2000 cu. ft., $1.40 per 1000; next 3000 cu. ft., $1.30 per 1000; next 5000 cu. ft., $1.20 per 1000; next 5000 cu. ft., $1.10 per 1000; all over 15,000 cu. ft. $1 per 1000; gross rates: 10 cents per 1000 cu. ft. higher than net rates; discounts, 10 cents per 1000 cu. ft. The new schedule will be put into effect July 1, 1913.

The Washington public service commission has formally adopted the danger sign for railroads provided for in the trespass act passed by the recent legislature and the red card tag for electrical switches called for in the electrical code passed by the same legislature. Both forms are being sent to the various railroads and electrical establishments in the state. All lines affected must put up before June 12th the following sign: "Danger! Trespassing on this property is a misdemeanor, punishable by fine and imprisonment. Chapter 128, laws 1913." The electrical code provides that every switch opened for the purpose of allowing linemen or others to work on the system must be supplied with a red card to be filled out as to time of opening, by whom it was opened and purpose of opening, to be signed by the person opening same. The idea is to do away with danger to workmen through carless switch operators.

NEWS OF CALIFORNIA RAILROAD COMMISSION.

The Pacific Gas & Electric Company has applied to the railroad commission for a certificate of public convenience and necessity for the construction of three additional power plants on the extension of Bear River, Placer county, and the construction of a transmission line from the Bear River development to Nicolaus in the Sacramento Valley. The applicant stated that the construction would provide for 35,000 horsepower at a cost of $2,396,000.

A decision was rendered granting authority to the Maclay Rancho Water Company to sell its telephone system, water and power systems in and around San Fernando, to the Consolidated Securities Company.

A decision was rendered granting authority to the Pacific Gas & Electric Company to issue $5,000,000 of debentures for the following purposes. Reimbursement of treasury for money expended upon capital construction from income, $3,750,000; for new construction work over the company's system, $1,250,000.

The Oro Electric Company has filed a petition asking for a rehearing upon the matters involved in its application for a certificate of public convenience to distribute electricity in Stockton.

The Mount Jackson Water & Power Company has applied for authority to increase water rates to its consumers at Rio Nido, Sonoma county.

A decision was rendered granting authority to the Half Moon Bay Light & Power Company to reimburse its treasury to the amount of $1165 through the sale of stock.

A supplemental order was issued granting authority to the Tulare County Power Company to issue $15,971 of promissory notes, and to pledge its bonds as collateral security therefor.

The Southern Sierras Power Company has applied for a certificate of public convenience and necessity to proceed to the completion of its work in Riverside county.

TRADE NOTES.

Evans-Dickson Company, Tacoma, recently sold to L. J. Vogtor a 50 h.p. motor for his gravel pit near the city.

The Arrow Electric Company 1627 Fourth avenue, Seattle, has just completed the wiring on the Montesano, Washington, High School.

The Sound Electric Company, 1010 First avenue, Seattle, has put in 2-50 h.p. motors for the P. G. McHugh asphalt paving plant on Lake Union.

The McGoldrick Lumber Company will install a 50 kw. direct current Allis-Chalmers generator for supplying power and light at its Spokane plant.

Preparations have been made by the Tacoma municipal lighting department for cooking demonstrations to be given during the first two weeks of each month at the city hall.

The A. G. Electric & Manufacturing Company, Seattle, has redesigned its 30-ampere knife switch, bringing it up to the new Underwriters' standard, which goes into effect October next.

David Dow & Son, Twenty-first and Spruce streets, Seattle, have purchased all of the electrical equipment, locomotives, etc., of the Whatcom Coal Company at Bellingham, Washington.

The Pacific Coast Coal Company will install an Allis-Chalmers Corliss engine 26 x 36 inches direct connected to a 300 kw., 120 r.p.m., 575 volt railway generator together with switchboard at its coal mines, Renton, Washington.

The entire sales department of the Puget Sound Traction Light & Power Company visited the Snoqualmie Falls power plant of the company some days ago, the object being to have the force familiarize itself with the equipment.

Cummings & Kiehl engineers, 506 Central building, Seattle, have begun the work of replacing a mile of wood stave pipe with 4 to 7 foot steel pipe for the Vancouver, (B. C.) Power Company, in connection with its Lake Buntzen power plant.

The city of Seattle has very recently placed in operation a complete stone crushing plant in connection with construction of the Cedar River dam. The plant is operated by a number of Allis-Chalmers induction motors of the cement mill type.

The Olympic Power Company, Port Angeles, Washington, has placed a contract for the substructure of its dam which blew out last fall, with James O. Hayworth, a Chicago con-

tractor. Mead & Seastone of Madison, Wisconsin, are the engineers on the job.

The St. Maries Lumber Company of St. Maries, Idaho, has installed a 500 kw. low-pressure Allis-Chalmers steam turbine unit for driving motors in its planing mill. This turbine will be equipped with an Allis-Chalmers type C centrifugal jet condenser.

The Seattle Construction & Drydock Company will drive a large air compressor with a 200 h.p. slow speed Allis-Chalmers motor of the heavy duty type recently purchased. The power will be supplied by the Puget Sound Traction, Light & Power Company.

The city of Ellensburg, Washington, will install a 300 kw. Allis-Chalmers generator in its new municipal lighting plant. This will be direct connected to a Francis turbine. The city has also ordered from the same company a motor generator set and 3-panel switchboard.

The Caldwell Machinery Company, 524 First avenue South, South Seattle, recently installed a small direct-connected unit for the Burbank Company at Burbank, Washington. The company also recently put in a light and power plant for the Mrs. Sanders ranch at Ellensburg, Washington.

Nicholas Lawson, commissioner of light and water Tacoma, has let a contract to N. A. Jones. local contractor, for the installation of 1660 ft. of 12 in. wood stave pipe and 7350 ft. of 6 in. wood stave pipe in the vicinity of Bismark, a suburb of the city. The contract price approximates $8000.

The Campbell River Lumber Company, White Rock, B. C., has placed orders with the Allis-Chalmers Company for a complete sawmill. This will be electrically driven throughout with about 1000 h.p. in electric motors of various sizes. The power will be furnished by the British Columbia Electric Company.

Buxbaum & Cooley, electrical engineers and contractors, 68 Columbia street, Seattle, recently installed a new enunciator in the steamer Iroquois. The company recently sold to the Manganese Products Corporation a 10 kw., 50-volt direct current hydroelectric plant to be used for lighting a large hotel in the Olympic mountains.

W. B. Collins, superintendent of electric works, Tacoma, announces that the city is preparing for heating and cooking demonstrations in connection with the general house furnishing store of Davis, Smith & Company in that city. The owners of the store will furnish the various makes of stoves, the space desired and do the advertising while the city will do the demonstrating.

Owing to a heavy increase in business the Manley-Moore Lumber Company of Tacoma has decided to double the capacity of its power plant and has placed an order with Allis-Chalmers Company for one 175 kw. form a.b. alternating current generator together with exciter and switchboard. A number of motors have been procured from the same source for use in various departments.

K. C. Schluss, superintendent of power and equipment Tacoma Railway & Power Company announces that 10 new car equipments have been received for the city lines. The cars are double end, 47 feet and 5 inches over all, semi-steel, without bulkheads, folding doors, pay on entry and a seating capacity of 52. They are equipped with 4 General Electric, 219 B. motors, K 35 controller, standard 0 50 tucks. Have National Break & Electric Company equipments with A 5 compressors; have both incandescent and arc headlights, air sanders and drop fenders.

Lewis, Wiley & Morse, Inc., hydraulic contractors, 706 Central building, Seattle, have the contract for filling Alki avenue from Atlantic street to Spokane avenue, a distance of 1¼ miles. One of the three units used by Lewis & Wiley on the Jackson street regrade is being used, consisting of a Westinghouse motor and two 4-stage centrifugal Worthington pumps. Seven hundred h.p. is utilized pumping 6,000,000 gallons per day against a 375 foot head. The dirt being used on the fill is being taken from the site of the proposed city stadium in West Seattle. Lewis, Wiley & Morse have become associated with the Ambursen Hydroelectric Company and will build the earth filled dams for that company.

BOOK REVIEWS.

Foundations and Machinery Fixing. By Francis H. Davies, A. M. I. E. E. Size 4¼ x 6½ in.; 152 pages; 52 illustrations; cloth binding. Published by D. Van Nostrand Company of New York, and for sale by The Technical Book Shop, 106 Rialto Bldg., San Francisco. Price $1.00.

The writer of this book who is also author of "Electric Power and Traction," and "The Commercial Engineer's Pocket Book," has contributed this as one of the several installation manuals recently published by this house. The subject of engine and machine foundations is a strangely neglected one. In this little work such subheadings as functions of foundations, trial bores, materials for foundations, holding-down bolts and anchor plates, excavation, construction, causes and effects of vibration and methods of isolating machinery are consecutively treated. The book is simple, yet thorough in its treatment, its only possible drawback for Western engineers being that the English monetary system is used throughout.

Regulation, Valuation and Depreciation of Public Utilities. By Samuel S. Wyer, Consulting Engineer. Size, 5½ x 8½ in.; 313 pages; replete with diagrams and tables; leather binding; gilded edges. Published by the Sears & Simpson Company of Columbus, Ohio, and for sale at the Technical Book Shop, 106 Rialto Bldg., San Francisco. Price, $5.00.

This book, which is written by a consulting engineer of full standing in the leading national engineering societies, treats in sixteen separate chapters of the public and the public utility in their respective relationship as to regulation, valuation and depreciation. Fundamental definitions, economies of utility problems, governmental power to regulate utilities, principles governing cost of utility service and engineering data necessary, constitute the leading subjects of discussion. Thirty-five pages are devoted to an excellent author's and subject index. A selected bibliography is also appended, which will be found useful. The chapters on electrolysis as related to depreciation contain much useful matter. The book will add much to the rather limited number of reference books upon this subject now available.

A Symposium on Scientific Management and Efficiency in College Administration. Comprising among others the papers presented at the efficiency session of the twentieth annual convention of the Society for the Promotion of Engineering Education. Size: 5½ x 8½ in.; 226 pages; one illustration; cloth binding. Published by the Society for the Promotion of Engineering Education and for sale at the Technical Book Shop, 106 Rialto Bldg., San Francisco. Price $1.00.

The book opens up with an introduction by F. B. Gilbreth showing by chart what scientific management is and what it can do. The various chapters are written by such well known men as F. A. Parkhurst, W. F. M. Goss and Wm. Kent. The papers all refer to the general subject of efficiency either as applied to college administration or to the conduct of business. In the latter case the papers deal with fundamental principles or with the actual teaching of scientific management. The range of discussion covers such subjects as educational demands of modern progress, the engineer as a manager and a broadened view of efficiency in enginering instruction. The book is most interesting throughout and unquestionably fills a place hitherto vacant in educational thought. The appendix written by F. B. Gilbreth on the place of motion study in scientific management fittingly closes this unique symposium.

NEWS NOTES

ILLUMINATION.

FRESNO, CAL.—Mayor Snow has under consideration a plan for the establishment of a municipal lighting plant in Fresno.

LANCASTER, CAL.—Representatives of the Southern Sierras Power Company were in Lancaster recently, making preliminary arrangements for this company to enter Lancaster.

SAN FRANCISCO, CAL.—To add to the attractiveness of the principal Chinatown streets, plans are in consideration by the Chinatown Property Owners' Association for the erection of lighting arches along Stockton street and Grant avenue.

POCATELLO, IDAHO.—The Utah Light & Power Company will soon start active operation in building an electric lighting and power system in Downey. A franchise has been granted, and a party of surveyors is now engaged in surveying for the distributing system.

COLFAX, CAL.—D. C. Gillen, who runs the local electric light plant has applied for authority to sell his plant to the Pacific Gas & Electric Company for $12,000. He placed the physical value of the property at $8000 and the remaining $4000 represented good-will and building up the business. His distributing system includes about eight miles of wires.

SAN FRANCISCO, CAL.—The Pacific Gas & Electric Company has submitted bids for furnishing gas and electric light to the city during the coming fiscal year. The rates asked for street and public building illumination are the same, except slight reductions from the existing charges in two items, the net result of which will mean a saving to the city for the year of about $4500.

MARYSVILLE, CAL.—The City Council has granted 50-year franchises to the Oro Electric Corporation and the Great Western Power Company to furnish light, heat and power within the city limits. Each company is to pay to the city 2 per cent of its gross earnings after the first five years. The city reserves the right of using the poles of both companies to stretch the wires of the municipal fire alarm system.

BAKERSFIELD, CAL.—Professor C. L. Cory of the State University, employed as an expert by the city in defense of the 50-cent gas ordinance, now before the Federal Court, announced that the rate fixed by the City Trustees would confiscate the property of the San Joaquin Light & Power Company, and could not be justified in court. City Attorney Laird, after examining the expert's report, said the ordinance would not be defended.

SEATTLE, WASH.—Rufus C. Dawes, vice-president of the Seattle Lighting Company; Henry M. Dawes, Chicago capitalist, and Charles G. Dawes, president of the Chicago Central Trust Company, are backing a proposal to build a large gas works and manufacture coke and other by-products at Seattle. The contemplated plant is to cover about 75 acres of land on the Duwamish River. Several million dollars are involved in the project. It is proposed to have the plant in operation within the next three years.

TRANSPORTATION.

SACRAMENTO, CAL.—The "Steamer Special," to be the fastest train in the Sacramento Valley, joining Chico, Oroville, Colusa, Marysville and Woodland with Sacramento, and making connections with the California Transportation Company's river boats, will be placed in service by the Northern Electric June 13. The new train will cut down the regular time between Chico and Sacramento 40 minutes, making the trip in 2 hours and 20 minutes. The distance between the cities is 90 miles.

SPOKANE, WASH.—An electric interurban line between Spokane and Wenatchee following the tracks of the Great Northern Railroad and tapping the same territory that the Hill road occupies at present is under consideration. Wall street capitalists are said to be back of the enterprise.

TACOMA, WASH.—At a recent election held in Tacoma the proposition to build a municipal electric railway line across the tide flats was carried, but the bonds for carrying the project through, amounting to $87,000, were lost. It is presumed that the next tax budget will provide for building the road.

PLEASANT HOME, ORE.—Trolley wires of the Mount Hood Railway have been strung to Cottrell, on the way to Bull Run. The work of electrifying the line is progressing rapidly between Portland and Bull Run. A considerable force of men is employed, and soon electricity will take the place of steam as motive power.

LOS ANGELES, CAL.—The Pacific Electric Railway Company announces that it will connect Long Beach and Redondo with an electric line skirting the ocean. Rights of way are now being secured, and construction will be started when all the right of way is under contract. The line will be an extension of the present Redondo Beach line, and will be eighteen miles long, costing about $5,000,000. The building of this line will complete a circle for Los Angeles, Redondo and Long Beach.

TULARE, CAL.—Six directors of the Big Four Electric Railway of this city, just elected, represent new capital which will finance the company in the completion of its lines connecting Tulare with Visalia, Porterville and Woodville. The new directors are: John C. Hays, president Mt. Whitney & Yosemite Power Company; John F. Jordan, president Citizens' Bank and the Palace Hotel Company of Visalia; W. A. Zimmerman, president Oregon County Savings & Trust Company of Santa Ana; R. Linder, Wm. Swall and J. R. Hitchcock.

PORTLAND, ORE.—Rapid progress is being made on the extension of the Woodstock car line from East Forty-sixth street, on Woodstock avenue, to East Fifty-seventh street, and the track will be completed in June. The Portland, Railway, Light & Power Company is preparing to lay double tracks on East Forty-first street, between Yukon street and Woodstock avenue, where a hard-surface pavement will be put down this year. Both places mean the construction of a mile and a half of new car track in the Woodstock district. The contractor has started grading on East Forty-first street.

STOCKTON, CAL.—Officials of the Tidewater Southern Railway report relative to the work of electrification of its system that all the equipment material for the entire line between Stockton and Modesto is on hand or covered by orders that will insure early delivery. Workmen are beginning to string the trolley wire. Poles are distributed as far as Escalon and erected over a distance of ten miles out, and brackets are ready for nearly the same distance. The work of building the $2000 depot at Escalon is well along. In Modesto the track has been laid on Ninth street. The cars are being painted in the Eastern shops, and should be delivered on time. As soon as the work of electrification is completed the Tidewater will call for bids on the extension to Turlock, involving about ten miles of road. Steel for the bridge across the Tuolumne River is framed and ready for

shipment. The Tidewater has expended for permanent improvements during a period of ten months $446,886.30.

SEATTLE, WASH.—The officials of the Lake Burien electric railway extending from Lake Burien to Spokane avenue, Seattle, a distance of seven miles, have made an offer of the road to the City of Seattle. The council thinks favorably of the proposition, and has asked the corporation counsel to prepare the tender in proper form, and have it signed by the officials of the company. The tender will set forth terms upon which the road is taken, how it will be operated, etc. If the road becomes the property of the city it is the intention to build an extension from Spokane avenue to Jackson street, a distance of about 1¾ miles, thereby connecting with the municipal line under construction.

OAKLAND, CAL.—The suburban electric lines of the Southern Pacific Company in Oakland, Alameda and Berkeley are to be separated as an operating organization from the steam lines about the bay, according to an announcement made by officers of the company. Directly in charge of the electric organization will be a local manager, to be appointed within a few days. Under him, W. H. Norton, at present assistant superintendent of the Western division, will supervise electric train operation. Paul Shoup, president of the Southern Pacific's big Southern California subsidiary, the Pacific Electric, and as such general overseer of all the Southern Pacific's electric properties, will remain the executive head of the trans-bay system.

FRESNO, CAL.—As soon as the right of way deeds can be cleared, the Fresno Traction Company will start construction of a railroad line from Muscatel to Biola, according to an announcement made by F. W. Webster, general manager. The Biola line will be 8½ miles in length, from Biola to the townsite of Muscatel, on the main line of the Southern Pacific. It will be a motor road at first, although it is the intention of the traction company to electrize it within a very short time after its completion. The route for a time, by motor, will be from Biola to Muscatel and thence down the main line of the Southern Pacific to the Southern Pacific depot in Fresno. When the line is put under wire, it will be extended from Muscatel to connect with the new line to the San Joaquin River, which the Fresno Traction Company will build. Work on the permanent survey for the San Joaquin River line was started recently, under the direction of Chris. Jensen. Instructions have been given by the traction company to its attorneys to apply for a franchise from the supervisors at once, and application for permission to build will be made immediately to the State Railroad Commission.

TRANSMISSION.

VISALIA, CAL.—The formal opening of the Mt. Whitney power plant No. 3, on the Kaweah River, was held last week. The new plant completes a circuit of three, and this is the Mt. Whitney's fifth plant in this county.

PORT ANGELES, WASH.—The Olympic Power Company has closed a contract for the rehabilitation of its plant on the Elwha River, which was damaged last fall by the blowing out of the dam. The new engineers and contractor say that it will be ready for operation in about five months.

PRESCOTT, ARIZ.—Ralph Cameron has announced that plans are practically completed for the establishment of a giant electric plant. The company, of which Cameron will be a prominent official, will be capitalized for $15,000,000, and is designed to furnish cheaper electrical power for nearly all of Arizona. Although not definitely settled, the plant will probably be located in the Grand Canyon.

PORTLAND, ORE.—The Pacific Power & Light Company has temporarily discontinued work on its hydroelectric plant at Hood River, Ore., which is to cost about $500,000 when completed. About $50,000 has been spent in preliminary work, and construction will be resumed in the fall. Officials of the company state that work was stopped because it was found that the money to be used in construction of this plant could be employed more profitably in betterments to several of the other operating plants of the company. The nine-mile concrete canal to carry water to the new generating station being built at Natches, on the North Yakima River, has been completed and a 5000 h.p. hydroelectric station is under construction there. Later a second station of 3500 h.p. is to be built at Natches if plans now under consideration are carried out.

PORTLAND, ORE.—The adoption of the new city charter, with the commission form of government, gives the commission practically full power over all utilities operating in the city. The principal utilites in Portland are the Portland Railway, Light & Power Company, controlled by E. W. Clark & Co.; the Portland Gas & Coke Company, one of the American Power & Light properties controlled by the Electric Bond & Share Company, and the Northwestern Electric Company, a new concern, not yet in operation, controlled by the Fleishhacker interests in San Francisco. The new charter gives to the city commission the general supervision and power of regulation of all public utilities within the city and of all persons and corporations engaged in their operation. The charter provides for as rigid accounting from public service corporations as it does of city officials and employees. Power is given to the city to own and operate utilities, or any plant or enterprise. The city may construct its own utilities, or it may take over any privately owned public utility, paying therefor by the issue of public utility certificates, secured by a mortgage on the utility purchased, and not a general obligation of the city. The commission is given power of compulsory investigation of corporations, and may say what are reasonable rates for service of public utility corporations. Reports must be made regularly by corporations, and failure to do so is punishable by fine or imprisonment. The commission is given power to make its own rules for carrying out all regulations provided in the new charter, and can forfeit the franchise of any utility disobeying these rules. Franchises are to be regarded as property and taxed as such. No franchise is to be granted for a longer period than 25 years, and no exclusive franchise shall be granted. Franchises may be used only by the interest securing it. There is to be a common user privilege in all franchises granted, and a referendum may be invoked any time within 60 days after passage of a franchise on a petition signed by 2000 voters.

TELEPHONE AND TELEGRAPH.

SOUTH PASADENA, CAL.—Plans have been completed by Norman F. Marsh for a brick telephone exchange building, to be erected on Rollins street, for the Home Telephone Company, which was recently granted a franchise by the Board of Trustees.

SACRAMENTO, CAL.—The controlling interest in the California and Oregon Company has been purchased by W. E. Hill, Scott Hendricks and A. J. Matthews of Sacramento. The new management has secured a lease for a period of years of the California and Oregon Telephone Company's lines between Reno and Lakeview, Ore.

ALAMEDA, CAL.—The result of a citizens' mass-meeting called by the City Council for a discussion of the granting of a continuance of the franchise of the Pacific Telephone and Telegraph Company, which has expired, was the ordering of the drafting of a franchise ordinance by the public utilities committee for a working basis for the council. The ordinance will include free use of telephones by the city, a fifteen-year renewal, a payment of 2 per cent of the gross revenue of the company to the city, and a mutual use of poles and conduits.